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FEBRUARY 1953

THE SCIENCE TEACHER

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- Biology—Why Not Make It Interesting?
- New Approaches Needed in Physics
- Atomic Energy in the Sixth Grade
- The Pittsburgh Convention

JOURNAL OF THE NATIONAL SCIENCE TEACHERS ASSOCIATION

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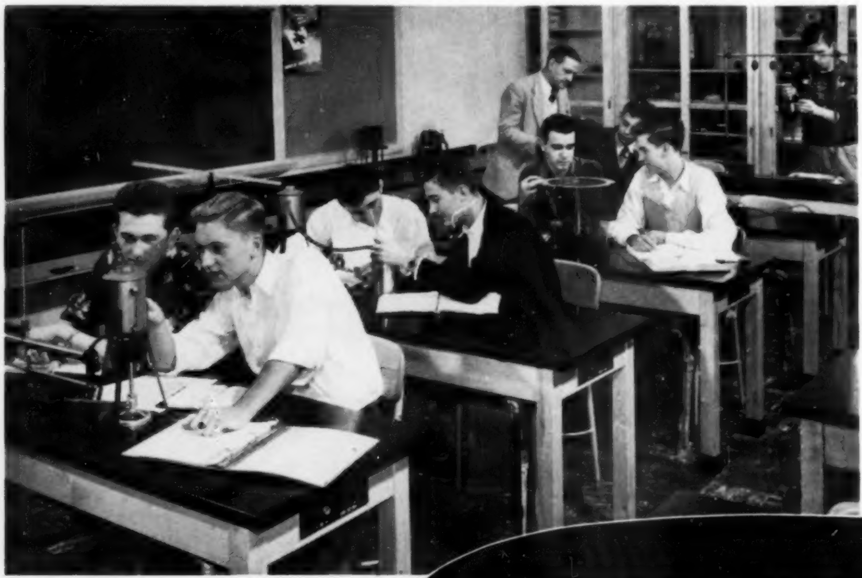

*Kibbee Streetman of West End High School, Birmingham, Alabama, winner of First Place Award in 1952 NSTA-ASM Science Achievement Awards program, division of grades 7-10.

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THE SCIENCE TEACHER

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THE NATIONAL SCIENCE TEACHERS ASSOCIATION

A Department of the National Education Association

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THIS MONTH'S COVER . . . shows how, comes March 17 or 18 or thereabouts, the boys and girls in science teaching from all parts of the country will be "headin' for Pittsburgh." The Big Show will include a dozen nationally famous speakers in addition to panels, discussion groups, two big social events, and opportunities unlimited to meet and talk with "names" you've always wanted to see in person. More information will be found on pages 37-40. *Drawing by Robert Pilgrim, Silver Spring, Maryland.*

Guided Missives

Zim's catalytic article in the September 1952 issue of THE SCIENCE TEACHER hammers effectively at the greatest weakness in science teaching today. He pinpoints the crux of the problem thus: "All through general education the present science curriculum is concerned with teaching people *about* science instead of letting them *do* science."

To meet the challenge calls for drastic action. Not enough of us realize how really different science teaching is from the teaching of history or English. Science teaching calls for more than *chalk* and *talk*. If our students are to *do*, then each school must have:

1. Well-equipped laboratories
2. Sufficient supplies, living, as well as bottled, and shelved.
3. A project room which is adequately supervised.
4. Small classes so that individual attention can be given to pupils while they are *doing*.

These four musts are expensive—but not unattainable. If local school boards cannot afford these expensive requirements of a minimum science education program, then they should receive the same type of financial assistance that vocational education (also expensive) is given.

The Smith-Hughes Act, passed in 1917, gave vocational education the wherewithal for training students in well-equipped shops. If we are to provide opportunities for . . ."students experiencing science," then a Smith-Hughes Act for science education is needed.

In spite of years of science education, we have been prevented from imparting the true values of our subject as Zim pictures them. Well-meaning science teachers, a twelve-year program, and new methods of instruction are all further aspects of a long-range frustration unless we can win financial support.

It is no longer a problem for the local school board alone. The problem is nationwide. The country is reaching a crisis in its shortage of trained scientists. The citizenry itself is scientifically illiterate in this greatest age of science.

The time is at hand for a positive approach. We need the leadership (why not NSTA?) to achieve a Smith-Hughes act for science education. There seems to be no other way to obtain the tools to teach science properly. Otherwise, although we may continue to set our sextants with Zim on the "two celestial bodies of science and education," we'll continue to cross the ocean in a rowboat.

MAURICE BLEIFELD
Newtown High School
New York City

Sorry that my renewal is late. I want you to know that I consider my membership in NSTA most valuable. The articles in THE SCIENCE TEACHER are stimulating and the books that I have received as a sustaining member have been extremely useful and excellent additions to my library at school.

RAYMOND F. SCOTT
Cambridge, Massachusetts

I haven't time for more than this: You're doing a terrific job with THE SCIENCE TEACHER and the packets and all the other stuff.

PHILIP PERKINS
Irvington, New Jersey

EDITOR'S NOTE: We simply must print this kind once in a while!

I enjoyed reading J. Edgar Morris' item "More PHIZ in the Physical Sciences." One item that doubtless Mr. Morris mentioned to his audience did not appear in print. The products of the combustion of carbon disulfide mixed with carbon tetrachloride can include phosgene ($COCl_2$) and other extremely toxic substances. Since the temperature of the experiment is not very high, these products may tend to diffuse if formed in a closed room. The caution of adequate ventilation for the experiment is respectfully submitted.

ELBERT C. WEAVER
Andover, Massachusetts

THE SCIENCE TEACHER

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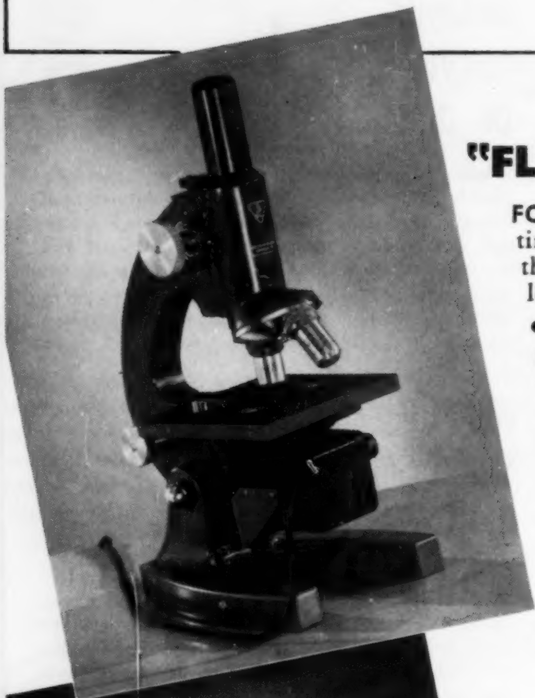

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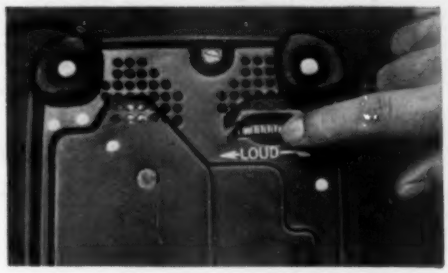

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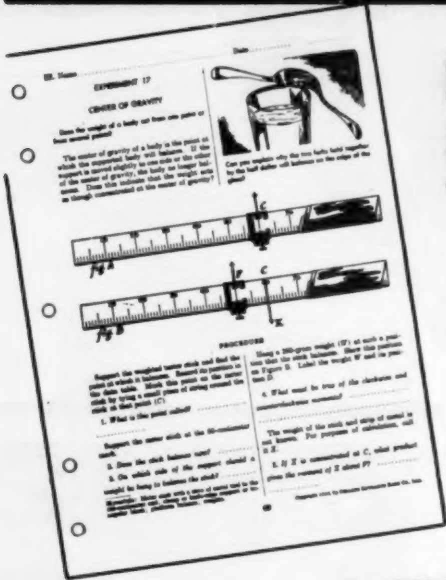

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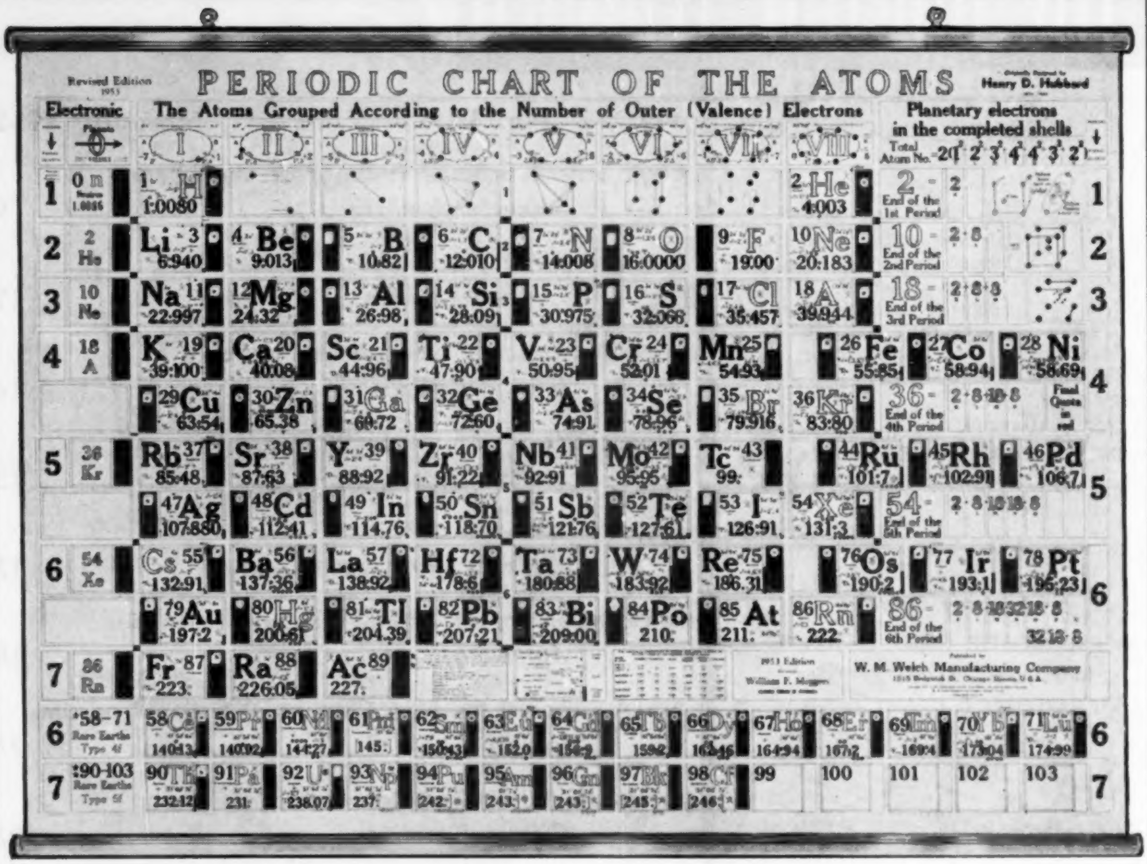

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HIGH SCHOOL SCIENCE in the Post-War Years

By SAMUEL SCHENBERG

TO UNDERSTAND just why we have fewer pupils in our science classes today than, let us say, at any time during the past decade, requires a study of the changes in our high school population within this period. These changes have been far-reaching in New York City and probably have their parallels elsewhere. In the fall of 1941 there were 230,321 pupils on register in the New York City high schools. This term the register had dropped to 167,745 students—a loss of 62,576 students or 27.2 per cent of the fall 1941 register. It will occasion no surprise that a loss of such magnitude affected the registers in every department in the high schools, and the science departments were no exceptions. During this period 26,896 science students vanished from our science departments—a loss in registration amounting to 19.8 per cent. The difference in these percentages seems to indicate that the science departments have fared a little better than the high schools as a whole but the losses were, nevertheless, very serious.

Concern for Science Enrollments

Although we cannot control the student population, we can be and are concerned with the number of our high school pupils who are given the opportunity to elect and take science courses. Taking the end points for the 1941-52 period, we find that in New York City 57.4 per cent of all high school students were registered in science courses in the fall of 1941 and 64.9 per cent in the fall of 1952. Peak enrollment in science was 71.7 per cent of the total high school registration in the fall of 1944. Of course this increase was due entirely to the impetus of the war years.

In the eyes of many administrators the urgent need for the study of science had disappeared by 1945 and we were returning to "normalcy." However, some of the gains have been preserved. Using 1935-1936, a pre-war year—when science registration stood at 53.3 per cent—as a basis for comparison with the war and post-war years, we see that 11.6 per cent more of our students are in science classes today than was the case in the fall of 1935. We therefore cannot talk of the "good old days" when we discuss the per cent of our enrolled students taking science; the percentage, even after a winnowing process, is higher than at any time prior to World War II.

All of us know that general science is one of the constants in the high school curriculum; all other sciences are elective. The effectiveness of our high school science program must therefore be measured by the number of students in the 10th, 11th, and 12th years who *elect* to continue their study of science. This percentage has varied within a very narrow range from 57.2 in the spring of 1947 to a high of 60 in the fall of 1950; it now stands at 59.1 per cent. This signifies that only 591 out of every 1000 students are electing a science in the last three years of high school. The question immediately arises in one's mind, Are we preparing our students to live fully in this atomic-scientific age?

Before attempting an answer, let us view the situation from the ramparts of the individual sciences. In most of our high schools, by long established practice (which is altogether sound), students who elect science in the 10th year are guided into biology. During the post-war years, the number of 10th-year students who elected biology also varied within a narrow range from 68 per cent in the fall of 1946 to a high of 74.3 per cent in the fall of 1947 and this term stands at 74.2 per cent. This signifies that approximately 742 out of every 1000 students enrolled in the 10th year are in biology classes. What happened to the other 258? Can we overlook the necessity for all students learning how to keep healthy, or the nature and cause of disease, or the functioning of one's body, or the interdependence of living things, or the need for conservation of our natural resources—just to mention some of the units in our biology course? If these units are important

and necessary, what other opportunities for getting this information will be provided—and where? Are 9th-year general science teachers in both the senior and junior high schools creating an appetite for electing science in the years to come? Who could possibly be better guidance counselors for advising students in the nature, scope, and importance of our science courses? And this is only half the story—we have a missionary job to do on our principals * and on our grade advisers.

Analysis for Physical Sciences

The analysis of the situation with respect to the physical sciences proved more difficult. There is no set order for the election of chemistry or physics in New York City. Each is offered in the 11th or 12th year of the high school. With the exception of two schools they are rarely offered below the 11th year. Therefore it is necessary to compare each science with the enrollment in both years.

The per cents of the students electing chemistry have remained fairly constant varying between a high of 17.7 per cent and a low of 15.3 per cent and this term stands at 17.5 per cent. In physics the variation has also been very small from a high of 11.3 per cent to a low of 9.4 per cent and this term stands at 10.4 per cent. If we combine both sciences, 27.9 per cent of all the students enrolled in grades 11 and 12 this term are registered in chemistry and physics classes. This implies that approximately 28 out of every 100 students in both grades are in chemistry or physics classes this term. This seems to me to be a very low percentage indeed. Is it not from this group that most of our future scientists and engineers will come? Are our schools heeding the great demand for scientifically trained men and women? The answer seems obvious. If we do not properly guide our good students who exhibit an interest and a flair for science, our ranks of scientifically trained men and women will remain woefully inadequate.

Science Teacher as Counselor

Here again I venture to say that our biology teachers, as the general science teachers before them, should also act as guidance counselors for the physical science area as well as for their own specialty. We are all *science* teachers—not splinter groups of general science, biology, chemistry, physics, and earth science teachers. Are there any others who are as well qualified or in a better position to guide and counsel? If the science teacher is not sufficiently acquainted with *all* the science courses in his school, might it not be a good idea for our science teachers club to bring the matter before their members and for our science chairmen to make this matter the subject for departmental conferences in the immediate future? Effective guidance is an important attribute of an effective teacher. It cannot be relegated entirely to others. If you do not exercise this prerogative, it is lost forever through disuse. May I suggest a slogan derived from the late political campaign: Don't be a "lanogut" (lazy, non-guidance teacher).

I have purposely separated earth science from chemistry and physics in my previous discussion because its history during the past decade is unique. In the fall of 1941, 5434 students or only 2.3 per cent of the high school population were in physiography classes. The number of earth science students dropped to the low of 889 (0.46) per cent) in the fall of 1943. The large decline was undoubtedly due to the introduction of war courses in navigation, meteorology, topography, and map reading. Simultaneously with the decline in the war courses we find a sharp increase in the number of earth science students—completely reversing the pupil population trend. In the fall of 1946 the number reached 5868 which represented 3 per cent of the total student

* Perhaps the *Bulletin* on "Science in Secondary Schools Today," prepared by NSTA for the National Association of Secondary School Principals, will help with our administrator colleagues.

Here is an article which we believe will prove enlightening and provocative to high school science teachers everywhere. Dr. Schenberg is supervisor of science in the New York City high schools and presented his analysis of science enrollments in that city before the Federation of Science Teachers of New York City last November 14. As he points out in his opening paragraph, the facts and figures for NYC probably have their parallels elsewhere throughout the nation.

For those who wish to be fully informed on science enrollment figures, we commend the following sources in addition to this article by Schenberg: Philip G. Johnson, *The Teaching of Science in Public High Schools,* Bulletin 1950, No. 9, Federal Security Agency, Office of Education, 20 cents; W. Edgar Martin, *The Teaching of General Biology in the Public High Schools of the United States,* Bulletin 1952, No. 9, Federal Security Agency, Office of Education, 20 cents (order these two titles from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.); and Philip G. Johnson, "Occurrences of Science Courses in American High Schools," *The Bulletin,* National Association of Secondary School Principals, January, 1953, $1.50 (order this title from NSTA).

enrollment and 6.4 per cent of the students in the 11th and 12th years. Since earth science is generally elected in the 11th and 12th years, enrollment figures can be compared with similar figures for chemistry and physics. This term 8.2 per cent of the 11th and 12th year students are in earth science classes which almost raises it to the status of physics.

The remarkable nature of this increase in the number of students electing earth science is brought out when we consider the fact that this science is offered currently in only 32 out of the 54 New York City high schools. If we were only to consider the schools which offer the course, the percentage of students enrolled in those schools in grades 11 and 12 taking earth science jumps to approximately 13. This indicates that the introduction of earth science will insure the growth of the physical science department. Earth science has profited from the war courses, particularly in the areas of meteorology, navigation, topography, and map reading. It is attuned to everyday phenomena close to the lives of high school students. In addition, it is recommended by grade counselors for students who cannot assimilate a science course with mathematical overtones. The absence of this course in the science curriculum of 21 of our schools is worthy of investigation by these schools.

How Effective a Program?

Up to this point, I have considered only those science courses which were elected by our average or better students. Students preparing for college are therefore found in these courses. Long ago, we came to the conclusion that a deep and abiding understanding of science and its methods of investigation *are highly desirable for all of our students.* With the advent of compulsory attendance to the 16th birthday and a changing school population, science educators in our high schools were quick to realize the necessity for modification of existing courses and the introduction of new courses to meet the needs, interests, and abilities of all pupils. In fact, it seems to me that *the introduction of applied, general, related, and advanced courses is a qualitative measure of the effectiveness of a school's science program.* Certainly, the absence of such courses in a school with a heterogeneous pupil population is an indication that little attention is being given both to the "general" student and to the very bright student. Let us examine these science offerings at this time.

Tabulations show that the per cents of the students electing these courses today are at or near their maximum for the post-war period, notwithstanding the very large decrease in the actual number of pupils in them caused by the corresponding fall in high school enrollments.

There is, however, one important factor which affects this picture materially. These courses are offered in only a relatively small number of schools; applied chemistry in 31, applied physics in 18, biological techniques in 9, general, related, or special sciences in 18, and advanced science courses in 11 of our high schools.

Science for All

Figures also show that 8.5 per cent of all of our students in the last three years of high school are taking science courses which have been designed specifically for their needs, interests, and abilities. I do not know of a better answer to the shibboleth, "We teach children—you teach subject matter." Perhaps some day some of our educators will consider examining the facts in the matter and destroy that broken record which only repeats and repeats itself. It does seem to me, however, that there is still much room for improvement here. We have no reason for complacency. More study of the objectives, methodology, and content of these courses in the science curriculum should result in additional offerings which will better meet the needs of those students for whom the courses were designed. Many of us are certain that the general biology syllabus and the revised applied physics syllabus are steps in that direction.

Up to this point I have discussed the total registrations in science in the 54 high schools. Let us consider some individual cases.

As might be expected, the number of students registered in science in the individual high schools varies greatly from school to school within the same boroughs and in different boroughs. Let us look at our three science high schools. We would expect them to lead the others in the number of students on register in science classes—and they do. It is interesting, to say the least, to find that our three science high schools with only 6.7 per cent of the total high school enrollment have 21.6 per cent of all the chemistry students and 33.8 per cent of all the physics students in New York City.

However, a study of the enrollment figures for biology reveals 100 per cent (of grade 10) in one school, 30.3 per cent in another, and 1.6 per cent in the third. Why the de-emphasis of biology in two of the schools and why the complete absence of earth science in all three? These questions require answers, especially in view of the large number of students enrolled in advanced science courses in these schools. We would normally expect these

(Please continue on page 28)

Biology—WHY NOT MAKE IT INTERESTING?

LORENZO LISONBEE

THERE are many ways to teach science and probably most of them are effective in reaching certain educational goals. Undoubtedly students learn a great deal of science through the use of printed manuals and workbooks, teacher-made worksheets, and the like. However, many science educators would say that complete reliance on such materials implies assuming (1) that the teacher always knows what is best for the student, and (2) that the students' interests and concerns are unimportant.

The following discussion is a report of what recently took place in a teaching situation wherein method and technique were purposely designed to involve student interest and planning. Since the teacher determines direction and method, the report also examines the forethoughts and attitudes of the teacher that permitted the ensuing situation to occur. It is realized that the question of whether the philosophy underlying these procedures is more efficacious in science education than any of several others may take a generation to establish.

Forethoughts of the Teacher

"Everyone in Southern Arizona should be able to identify the deadly species of scorpion from the nondeadly, and to know how to administer first aid for the scorpion sting (silently thinks the teacher). A good place to consider this matter is in high school biology. Involvements with the scorpion could be an interesting lead to important concepts directly and indirectly related to the study, and it is possible, as one thing leads to another, that important concepts may be introduced which may be unrelated to the scorpion. I, the teacher, shall await for an opening, an occasion when student interest begins to kindle on the matter. I shall then grasp the opportunity and use the drafts of various professional devices to arouse a flame of enthusiasm. (Or, in contrast, I could brush aside the first interest shown in scorpions as unimportant, and let the flame die.) Before the flame begins to get too low, it would be hoped that many avenues would be explored."

A Log of Events

Sept. 25. During group reportings on various insect topics, Johnny Merill made a verbal slip by referring to scorpions as insects. A student corrected him. Johnny's final response was, "Well, we are going to study scorpions, aren't we?" The teacher answered, "Perhaps, if you really want to". No more comments about scorpions at this time.

Sept. 30. Joe Martin brought a giant hairy scorpion to class. It was only casually displayed. Word got around, however. During the day a number of students asked, "Where is the scorpion?"

Oct. 6. Dr. Herbert L. Stahnke, zoologist at Arizona State College, gave the first of a series of weekly television programs under the general title, "Desert Denizens," wherein he referred briefly to scorpions and centipedes. Dr. Stahnke is an authority on scorpions.

Oct. 7. A lot of talk today in all the classes about the TV program. The teacher had the scorpion conspicuously displayed. During each period, the teacher picked up the scorpion by the tail. Aghasts followed. "Won't he sting you?" "Isn't he deadly?" etc.

The teacher responded with questions and with only enough information to arouse interest. The teacher finally asked, "Would you like to study scorpions?" The answer was an unanimous "Yes" in all five classes.

The areas of interest, indicated by various ways among the classes, concerned identification, control, and treatment. A number of students (but not all) indicated interest in working in one of these three areas. Groups were organized. Each class was asked whether anyone in the class knew anything about scorpions. Students were encouraged to bring in living or dead specimens, pertinent newspaper clippings, and other related materials. October 10 was heralded as Scorpion Day.

Timid Alice Soule came to the teacher after the first period class and said that her father had over one hundred Kodachrome slides on the scorpion, which he took for Dr. Stahnke. "Would you be interested?" "Certainly," I said, "providing you present the slides and explain them."

Oct. 9. Alice Soule came in after school to give a preview of the Kodachromes. The teacher gave suggestions on how to make an interesting presentation.

Groups, in the meantime, had been permitted class time where needed to prepare their reports for October 10.

Oct. 10. Scorpion Day. From literature provided by the teacher and the library, several reports were given by students. By this time the three local

By an interesting and timely coincidence, these articles by Lisonbee and Ruchlis (page 14) came almost in the same mail as Dr. Schenberg's article. Here, it seemed to us, were teaching suggestions from opposite ends of the country which pointed toward implementation of some of the points made by the latter. This triumvirate, we believe, have presented one of the best *combinations* of ideas we have been privileged to print.

Mr. Hyman Ruchlis is chairman of the science department in the Bushwick High School, Brooklyn, New York, and is president of the Federation of Science Teacher Associations of New York City. He is co-author of a textbook of high school physics recently published by Harcourt, Brace and Company.

Mr. Lorenzo Lisonbee is a member of the biology department in North Phoenix High School, Phoenix, Arizona. We were privileged to visit this school on a recent field trip and were mightily impressed with the attractiveness of the science rooms and the emphasis on *student activity* which was so evident throughout the science department. Mr. Lisonbee is serving as Chairman for Region VIII in the 1953 Science Achievement Awards program.

species of scorpions had been brought in to class and were used in identification. Alice Soule gave her illustrated lecture to the first period class. The teacher arranged with the Registrar to have Alice excused from her classes on October 14 to give the lecture to the other biology classes.

Oct. 13. Reports continued. A great deal of class interest was shown in a demonstration (by one of the students) of the first aid treatment using a tourniquet and ice.

Dr. Stahnke's television program that night dealt somewhat on the general characteristics of arthropods, referring frequently to scorpions.

Oct. 14. Alice Soule gave the illustrated lecture to the other four classes. The slides were a good summary of the reports, and included a good explanation of how serum was prepared for the treatment of the scorpion sting.

All of this led, in the days that followed, to further investigations into the nature of serum, the composition of blood, various diseases treated by the use of serum, the relationship of scorpions to other arthropods, black widow spiders, tarantulas, Gila monsters, types of venom, the effect of venom on humans and other animals, how the potency of various venoms compare, facts and fancies concerning the cobra, etc. Black widow spiders, turtles, and snakes were brought to class. One day was designated as Snake Day.

This may appear to be hit-and-miss teaching to many teachers. But even so, important concepts were introduced in a manner which utilized student interest and entailed student-teacher planning and student participation. The experienced teacher will get through the year with everything hit and nothing missed—if he knows beforehand what he wants to hit and is alerted to even the smallest displays of interest of students, and if he uses various devices to arouse and intensify interest.

Teacher Makes Decisions

In every teaching situation, the teacher gives direction to activities; he must decide whether the pursuit of a particular interest area would be important and vital to his age group. What the teacher considers vital comes from association with youth, philosophies of leading thinkers, and research studies. In any case the students must help decide what is important. To make instruction vital, ***the student*** must have a part in the planning and in the execution of plans. The importance of topics may vary from year to year and from class to class, according to the needs and interests of students at hand as individuals and as a group.

Some may ask, after considering the log of events recorded in the preceding paragraphs, "What were you doing between events?" Any number of interesting things were going on. Tommy Whipple, a second-period biology student, was excused from other classes about this time and talked to each class about Mr. Quick and his lady bird beetles. Tommy worked for Mr. Quick, his neighbor, during the summer, collecting barrels of ladybird beetles, and had many interesting (and instructive) things to tell. All this came out of the unit on insects. Deer season opened October 24, and some of the intervals between dates were used in becoming acquainted with Arizona hunting and fishing regulations, identifying wild game of the state, seeing a movie film on wild game, and listening to a lecture from the Arizona Fish and Game Commission.

Where were the guides to study? There were no printed study guides, worksheets, no workbooks, no syllabi. But a large number of students prepared reports, did research, and all of them kept a log of daily events in their notebooks, including a brief listing of important ideas, concepts, and principles introduced during the day.

Interest was high, learning was easy, experiences were rich, growth was inevitable, and everyone, including the teacher, had an enjoyable time. Undoubtedly much "subject matter" of even secondary consequence would be remembered a lifetime.

Is there a more fruitful way to teach?

New Approaches Needed in PHYSICS

HYMAN RUCHLIS

ALL of the sciences are now being evaluated throughout the nation. Teachers and citizens are questioning approach and the method; they are seeking new and better ways to teach science.

In some ways physics teaching needs the most drastic overhauling of all. For many years it has been assumed that the subject of physics is "tough", that it must be mathematical, and that it should be designed to train technicians and engineers. The sign on the door says: "Only the best need apply. All others stay out".

Are these assumptions valid? Is physics really a "tough" subject; is it only for the elite? Is it only for technicians and engineers? Or can it be found useful to John and Mary Jones who will be ordinary consumers and citizens?

Many teachers believe that physics is a subject that can produce major benefits for every educable pupil. And that includes the vast majority of the pupils in our schools.

Stop for a moment and consider the matter. Joe Smith is a truckdriver and knows nothing about inertia. So he throws the hammer onto the shelf right behind his head and loads his truck behind the cab with some heavy iron ingots, stacked up high. Then and there, a knowledge of inertia and principles of motion may mean the difference between life and death to Joe Smith. On a sudden, short stop that hammer may hit him in the head and kill him. His load of ingots may crash through the cab and crush him. This lesson should be driven home to our pupils. *Physics is a life and death subject.*

I feel certain that the humanized, environmental type of physics will solve our perplexing and perpetual problem of getting pupils to take the subject and go on from there to higher studies.

I round the corner in my car on the way to school and see a man on a ladder which makes an angle almost 40° to the ground. That observation becomes a lesson in our physics class that day in application of the principles of forces, components, friction, stability. We learn why the man on that ladder has one leg in a hospital ward. We see that a simple balancing of component forces resulting from tying a rope from the ladder to the wall may save his life.

I tell the class about my little son who stands on a chair and leans over to get some cookies in an upper closet. He knows nothing about center of gravity and I must teach him how to protect himself from injury. (Of course, I can't stop him from standing on the chair when I'm not around.)

I tell the students about my experience one summer in a country place where a young man had his first job as a waiter. I trembled as he stood over me with the hot soup, taking the plates off his shaky and unstable tray. After the meal I called him aside and showed him how to widen the base to increase stability by spreading his fingers apart. I explained that he should put the heavy objects in the center of the tray (to reduce the moments and keep the center of gravity within the limits of the base). I showed him how to compensate for a shifting center of gravity when he took one plate off an edge by next removing a plate on the opposite side of the tray. There were other lessons, too. At the end of the next meal, with a creditable job of tray-carrying behind him, he approached me and beamed. "You must have been some waiter."

When my physics classes solve life problems based on the theory underlying the advice given to this young waiter, they begin to see that physics deals with everyday things as well as dry, mathematical principles. Their interest is kindled and they approach the other parts of the course with greater zest.

In short, our physics teaching should get away from the cut-and-dried mechanical drilling of problem after problem which most of the youngsters cannot understand. Instead, our teaching should reach out into the environment. Every time we touch a spot in their lives we teach them to be better consumers and citizens, and possibly better scientists. We give them greater appreciation of the subject and whet their appetites for more intensive study of physics.

"But," say some, "we have no time." I cannot agree. Just make the subject 1/3 or 1/4 mathematics instead of 2/3 or 3/4 and you get all the time you need. If necessary, cut out that Archimedes' Principle problem with a 1000-pound rock of 5-cubic foot volume tied to a 500-pound log of 8-cubic foot volume. Is it really important whether the combination sinks or floats? Or how much force it takes to make it sink or float? Yes, in a way. But not anywhere near as important as the shaky lad-

ders and chairs, the hammer and iron ingots behind the driver, or carrying a tray of dishes without disaster. In other words, let's make mathematics a tool that is subordinate to the physical principles. Let's stress principles in relationship to real, environmental situations. Unfortunately, too much of physics teaching is wagged by the mathematical tail, with the result that we drive pupils away from a subject they need in our modern world.

The subject of physics is no tougher than we make it. The tough tests we give our pupils, even though they may seem "objective," are based on our subjective standards as to what the course should be like and who should take the course. If we think that physics is for the elite, then of course we make it a tough course. If we believe, as I do, that the course should be for everybody, then we set the content at a level that an average pupil can master.

Somewhere in the back of the room I can hear someone mutter, "Tearing down our standards, eh?" I can't agree that this is so. I give tests to my classes. But I make sure that the marking system is arranged in such a way that the bright youngster must work to capacity for his mark over 90, while the average youngster with a 75 average can make his 75. It's simple. Give a great many questions of moderate difficulty totalling about 80 points, and then give 20 points in tough, time-consuming questions. If necessary, reduce the credit deducted per question until the marks fit a reasonable pattern. The bright pupils get their challenge. The average pupils get 70's, 75's, and 80's, as they should, and the subject is no longer "tough". Put in a high proportion of practical questions, an occasional humorous question, and the pupils are happy and contented (in the main), receiving the kind of satisfaction that is the basic element in successful teaching.

I know that this approach is not new. Many teachers have used such approaches in successful physics teaching. But it is far from the approach used by the majority of teachers. And this practical approach to a "humanized" physics is long overdue as a majority trend.

One final point. What will the college people say about this new trend? I think they will accept it with joy. They complain bitterly about the erroneous concepts our pupils pick up (not necessarily from us). They will be happy to get pupils with a clear grasp of physical principles based on their environment who can then go on to more abstract principles in an adult way.

ATOMIC ENERGY
In The Sixth Grade

By MILDRED EINZIG

Supervisory Assistant, Gracemount Elementary School, Cleveland, Ohio

THE TERM "ATOMIC ENERGY" is familiar to many children who listen to and observe radio and television programs, and read newspapers or magazines. Children frequently have little background with which to evaluate what they read, hear, and see. As a result, misconceptions are likely to develop. Fear of atomic bombs is sometimes in children's thinking. An experiment with a unit on atomic energy was carried on in 1950 in the sixth grade of the Miles Standish elementary school in Cleveland. It was hoped that by the development of simple concepts, the children might find more meaningful what they saw and heard on the subject. Furthermore, it was hoped that the children might comprehend more fully the constructive possibilities of atomic energy.

To prepare for teaching the unit, the participating teachers read *Atomics for the Millions* by Eidenoff and Ruchlis and *Meet the Atom* by Frisch. Several children's books were also read.

When the problem of atomic energy was introduced to the class, the pupils were very enthusiastic. The material was challenging and so was the fact that they were the only class in the city working on the unit.

The actual study began by listing questions on the blackboard which the pupils wanted to have answered. The class secretary copied these questions into her notebook.

What is atomic energy made of? How powerful is it? Why is it called atomic energy?
How was it discovered? Where is it found?

What is it used for? How does it help us? How may it cure certain diseases? Why it is so dangerous? Are there peacetime uses?
What are atoms? What makes them so powerful? How are atoms put together? Where do atoms get their power? What is the origin of atoms?
Do atoms make changes? How do atoms become radioactive?

Cleveland has courses of study in elementary science for all grade levels. These make it possible to build on the previous science experiences of the children. The introductory work was related to a fifth-grade unit on elements and compounds. The 98 chemical elements were compared to the 26 letters of the alphabet, and the innumerable compounds were compared to words. The children enjoyed "spelling" some of the compounds using the symbols of the elements; e. g., H_2O for water and CO_2 for carbon dioxide. Children were encouraged to bring to school many compounds and elements for an exhibit. When possible, the constituent elements of a compound were exhibited beside the compound. All elements and compounds were labeled. Elements were listed under the following headings: gases, metals, the elements necessary for life, and some of the newly created elements. The children pasted pictures of elements and compounds in their notebooks.

The concept of the ultramicroscopic size of the atom was difficult to develop. To define an atom simply as the smallest possible particle of an element is not enough. Many books give interesting illustrations on the idea of size. To give some idea of the infinitesimal size of the atom, such illustrations as the following were used:

1. 110 million atoms lined up end-to-end will measure an inch.
2. 4500 followed by 15 zeros will constitute the number of atoms in a lump of sugar.

Thus, the children were led to realize that no one can visualize anything so small as an atom.

The unit on astronomy served as a basis for developing certain other concepts related to the atom. Pupils compared the structure of the solar system with that of the atom. For example, the heavy nucleus was likened to the sun and the electrons to the planets whirling in their orbits around the sun. A space ratio was made by considering the nucleus as a large baseball and imagining the electrons half a mile away. The difficult concept here is that empty space can appear solid. *The Picture Book of Molecules and Atoms* by Myers is most helpful at this point.

In order to explain why the electrons do not whirl away from their nucleus, the previously studied unit on magnetism was recalled. The nucleus was likened to one pole of a magnet, the electrons to the other. Just as unlike poles of magnets attract, the nucleus and the electrons also attract each other.

After the pupils learned that each element differs from every other element because its nucleus is different, the structure of the nucleus became the problem. The hydrogen atom, with its one proton was studied first. Reference was made to the positive and negative binding posts of a dry cell. The proton has a positive charge and the electron has a negative charge. With help, the children were able to conclude that they would receive no electrical shock from handling ordinary materials because their atoms contain an equal number of protons and electrons, and the electrical charges cancel each other.

Diagrams were made to represent ideas about atoms, such as atoms of hydrogen, carbon, oxygen, and other familiar elements. Plus signs in the center of each diagram were used to represent the protons in the nucleus. Small circles with minus signs were used to represent the electrons. These were placed in orbits around the nucleus.

At this point, the children wondered why the positive-charged protons in the nucleus did not repel each other and break up the nucleus. To solve this problem, the function of the neutrons was introduced. By reading, the children discovered that these particles with no electrical charge served as an "atomic glue" to hold the nucleus together.

To help the children visualize the construction of an atom, diagrams were made using dots punched out of colored paper. Colors were chosen to represent the three different particles in the atom—the protons, the electrons, and the neutrons. By counting the correct number of dots for each particle in the atom they were representing, the children were able to sense in a concrete way the reason why one element differs from another. After pasting two dots for hydrogen and the many dots for the uranium atom, it was not difficult for the children to understand why hydrogen is a light gas and uranium a heavy solid.

Three dimensional models were made also. Fine copper wire circles were used for the orbits. Tiny beads on the orbits represented the electrons. Tiny beads of two colors representing the correct numbers of protons and neutrons were bunched together for the nucleus.

The children were interested in the stories of the medieval alchemists who tried to change other metals into gold. They began to understand that it

(Please continue on page 34)

PROJECTS FOR SCIENCE FAIRS

By ELBERT C. WEAVER*

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THESE COMMENTS are written from the standpoint of a judge of science fairs. The lasting impression of hours of patient work on the part of the students, and hours and hours of planning and scampering around for them on the part of parents and teachers has been burned in. Certainly science fairs put the time of the youth of the land to good constructive effort. As such, they are a step in the right direction.

Science fairs, however, are not places of amusement, and the exhibits of work done should not be prepared for amusement purposes. Further, undue decoration, crepe paper, lace doilies, and tinsel are likewise inappropriate at a science fair. It is not a window-display.

A science fair is simply an exhibit of the work of students on science projects.

Electronic projects are particularly time-consuming to judge, and they must be almost entirely unappreciated by the general public. To assist the understanding of both the judge and the public, it is suggested that each electronics exhibit carry with it a fairly large, wiring diagram. On this diagram the various portions of the hook-up such as "power supply" and "amplifier" can be marked off in colored pencil. The corresponding sections of the hook-up itself can be similarly marked with tapes. In this manner both the judge and the public can get a quicker slant into Johnny's problem, and then tell how he solved it by making an electronic device.

Some of the most interesting exhibits include the original notebook of the student. On-the-spot sketches and tables of data taken in the laboratory are included in the notebook. Transparent protectors can be used for the notebook pages while they are on exhibit. These protectors may be expensive, but they are not consumed. Teachers should advise students who are using textbooks or reference books as the source of their information for exhibits to look at the date on the title page or nearby. They should make sure before they start that they are not using some outdated explanation, or even some erroneous material.

Also, exhort your students to make *measurements*, series of them. Even temperature changes as recorded on a common outdoor thermometer are significant. They may not be precise, but they are a start.

Here are suggestions for ten types of projects. In all of them measurements can be made. In many, graphs of data showing the relationships among several factors can be prepared.

1. Study the thermal efficiency of the various types of market bags used by the customer to carry home frozen foods. Compare double paper with aluminum-foil lined, with shredded-paper lined, with other sorts. Take rate of temperature drop over a series of intervals with a warm object placed within the bag until the contents reach room temperature. Then try the transfer of heat in the other direction.
2. Try simple electroplating onto small steel (or copper) objects. Vary the temperature of the bath and compare a series of results. Also, vary the time of plating, the type of cathode surface, the current density, the concentration of the electrolyte, the cation in the electrolyte, and the sort of anode. Try the effect of adding varieties of colloidal materials to the electrolyte.
3. Study your own city water supply. Ask the technical people in the water department if there are dead ends that do not show residual chlorine always in adequate amount, and where they sometimes pick up *B. coli.* Check water temperature, residual chlorine with the orthotoluidine test (or possibly starch and potassium iodide), pH, color, and make a culture of the water.
4. An even more fascinating and possibly useful study is that of a swimming pool in respect to the same variables mentioned for the water-supply study.
5. Used postage stamps (some varieties) make reasonably good indicators. Make a pH-scale range by the use of acids and bases. Now find the range within which the dye or pigment on the stamp is sensitive. Record and display the results.
6. In a similar manner, some vegetable and berry juices are indicators, blueberry juice for example. Preservatives may be needed. Measure the pH

* A portion of a panel discussion on "Judging Science Fairs" held by the New England Association of Chemistry Teachers, the Eastern Association of Physics Teachers, and the New England Biological Association in joint session at Boston College, Boston, Massachusetts, December 13, 1952.

range and the colors. If the colors don't keep, paint them onto a chart while you have them.

7. Working models always make a good project, especially working models that work. Many sorts of measurements will be needed to make the model, and after it is completed you can use it as a source of information for further measurements. Models of household appliances such as an incinerator can be suggested.
8. Many science project workers think first of electricity as the source of power. But don't sell fuel gas short. Its possibilities are also very great, and a model distribution system of a gas layout offers as much to the student as an electric distribution system. Also, you can make a model gasometer, and make many measurements in experiments in which gas is used.
9. A model torsion balance that works offers a challenge. Measure its reliability at different ranges, and also its sensitivity.
10. Many new industrial solvents are available. Why not find out the solubility of several simple inorganic salts in one of these solvents at different temperatures? Saturate the solvent with the salt selected but have some undissolved salt left after stirring. Measure the temperature and draw off a known amount into a weighed dish. Evaporate the solvent and reweigh the dish. Change the temperature and repeat the experiment. After several such solubility values have been found, you can draw a solubility curve. The possibilities along this line are almost limitless. For example, how soluble is potassium nitrate in saturated sodium chloride solution at several temperatures?

In summary, I would urge greater emphasis on careful and precise *experimentation*—simple though the experiments may appear at first glance—and on working models that really work; less emphasis on flashy displays and efforts exerted mostly as "showcase" techniques.

A Half-Century of NOBEL PRIZES IN SCIENCE

By ANTON POSTL

Assistant Professor of Science, Oregon College of Education, Monmouth, Oregon

Alfred Nobel (1833-96), the Swedish inventor, hit upon the idea of combining the dangerous liquid explosive nitroglycerin, which was first synthesized in 1847 by Sobrero in Turin, with Kieselguhr and thus produced the much more easily manageable explosive known as dynamite. This and some other inventions in allied fields enabled him to amass a sizeable fortune. Conscious of the fact that his inventions may be used to either advance or destroy man and under the influence of friends, he left his estate in the form of a trust fund the income of which is annually awarded in the form of highly coveted prizes in five fields, namely: *chemistry, physics, physiology and medicine, literature,* and *peace.*

Though the monetary value of the prizes (about $40,000 depending on earnings and exchange values) is considerable, the individual and national honor that goes with it is even greater. In fact the Nobel prizes have, in the past, been used as an index of the scientific and cultural standing of a nation.

The Nobel prizes have now been awarded for a half-century (1901-1950) and in this paper an attempt will be made to briefly summarize some of the more outstanding facts as regards the awards in the natural sciences. The science awards are made on the following recognition and are decided upon by the agencies listed:

A. Chemical discovery or improvement—Swedish Academy of Science in Stockholm.

B. Discovery or invention in the domain of physics—Swedish Academy of Science in Stockholm.

C. Discovery in the domain of physiology or medicine—Caroline Medical Institute in Stockholm.

The following tables I-VI include all the assembled information covering the first fifty years of Nobel prizes and also the first half of the twentieth century. It might be well to point out that in certain years no prizes were awarded, and also that the work worthy of recognition need not have been performed during the year preceding the giving of the award.

In the last table, the countries are arranged in a descending order according to the total number of prizes received during the fifty year period. This arrangement, however, conceals any possible trends during the period.

TABLE I

Year	CHEMISTRY			PHYSICS			PHYSIOLOGY AND MEDICINE		
	Name	*Country*	*Work*	*Name*	*Country*	*Work*	*Name*	*Country*	*Work*
1901	J. H. van't Hoff	Netherlands	Chem. Dynamics Osm. Press.	W. C. Roentgen	Germany	X-Ray Disc.	E. A. von Behring	Germany	Diphtheria Serum
1902	E. Fischer	Germany	Sugar and Purine Synth.	H. A. Lorentz P. Zeeman	Netherlands Netherlands	Zeeman Effect	R. Ross	Great Britain	Malaria Mosquito to Human
1903	S. A. Arrhenius	Sweden	Electrolytic Diss. Theory	H. A. Becquerel P. Curie M. S. Curie	France France	Radioactivity	N. R. Finsen	Denmark	Light Treatments for Skin diseases
1904	W. Ramsey	Great Britain	Inert Gases	Lord Rayleigh	Great Britain	Gas Studies Argon Disc.	I. P. Pavlov	Russia	Physiol. Digestion
1905	A. von Baeyer	Germany	Organic Dyes	P. Lenard	Germany	Cathode Rays	R. Koch	Germany	Scient. Bacteriology & cultures
1906	H. Moissan	France	F Isolation & Elect. Furnace	J. J. Thomson	Great Britain	Discharges through gases	C. Golgi S. Ramon y Cajal	Italy Spain	Struct. of Nervous System
1907	E. Büchner	Germany	Non-cellular Fermentation	A. A. Michelson	United States	Spectroscopic & Metrologic-Interferometer	C. L. A. Laveran	France	Protozoan dis. Trypanosomes
1908	E. Rutherford	Great Britain	Radioactive Decay	G. Lippmann	France	Color Photography	P. Ehrlich E. Metchnikoff	Germany Russia	Immunity
1909	W. Ostwald	Germany	Catalysis Equil. React. Vel.	G. Marconi K. F. Braun	Italy Germany	Wireless Devel.	T. Kocher	Switzerland	Thyroid Phys., Path. Surg.
1910	O. Wallach	Germany	Allicyclic Combinations	J. D. van der Waals	Netherlands	Gas Laws	A. Kossel	Germany	Cellular Chem. Albumin

TABLE II

1911	Marie S. Curie	France	Isol. of Ra	W. Wien	Germany	Heat Radiation Laws	A. Gullstrand	Sweden	Dioptrics of Eyes
1912	V. Grignard P. Sabatier	France France	Grig. React. Hydr. Org.	G. Dalen	Sweden	Auto. Lighting of Light house	A. Carrel	United States	Vascular Seams Blood Vessel Transpl.
1913	A. Werner	Switzerland	Complex Ions	H. Kamerlingh-Onnes	Netherlands	Liquid He & Low Temp.	C. Richet	France	Anaphylactic Test
1914	I. W. Richards	United States	At. Wt. Det.	M. von Laue	Germany	X-Ray Diffraction	R. Barány	Austria	Phys. & Path. of Vestib. Hyp.
1915	R. Willstätter	Germany	Chlorophyll Invest.	W. H. Bragg W. L. Bragg	Great Britain	Crystal Struct. X-Rays	No Award		

TABLE II—Continued

Year	CHEMISTRY			PHYSICS			PHYSIOLOGY AND MEDICINE		
	Name	*Country*	*Work*	*Name*	*Country*	*Work*	*Name*	*Country*	*Work*
1916	No Award			No Award			No Award		
1917	No Award			C. G. Barkla	Great Britain	Atomic-X-Ray Spectra	No Award		
1918	F. Haber	Germany	NH_3 Synth.	M. Planck	Germany	Quantum Theory of Radiation	No Award		
1919	No Award			J. Stark	Germany	Stark Effect on Spectrum lines	J. Bordet	Belgium	Immunity
1920	W. Nernst	Germany	Thermochem.	C. E. Guillaume	Switzerland	Ni-Steel Alloys Anomalies	A. Krogh	Denmark	Capillary Regulat.

TABLE III

1921	F. Soddy	Great Britain	Radioactive Isotopes	A. Einstein	Germany	Theory of Relativity Photo-el. Eff.	No Award		
1922	F. W. Aston	Great Britain	Isotope Mixt.	N. Bohr	Denmark	Atomic Structure	A. V. Hill O. Meyerhoff	Great Britain Germany	Heat-Muscles O_2 Consumption
1923	F. Pregl	Austria	Org. Micro Analysis	R. A. Millikan	United States	Electron Chge. & Photo-el. Eff.	F. G. Banting J. J. R. Macleod	Canada Canada	Insulin
1924	No Award			K. M. G. Siegbahn	Sweden	X-Ray Spectroscopy	W. Einthoven	Netherlands	Electrocardiograph
1925	R. Zsigmondy	Germany	Heterog. Nat. of Coll. Solut.	J. Franck G. Hertz	Germany Germany	Electron Impact. on Atoms	No Award		
1926	I. Svedberg	Sweden	Disperse Systems	J. Perrin	France	Sedimentation	J. Fibiger	Denmark	Spiroptera Carcinoma
1927	H. Wieland	Germany	Bile Acids	A. H. Compton C. T. R. Wilson	United States Great Britain	Compton Eff. Cloud Chamber	J. Wagner-Jauregg	Austria	Malaria Vaccin. in Dem. Paralytica
1928	A. Windaus	Germany	Sterins & Vitamins	O. W. Richardson	Great Britain	Thermal Ions	C. J. H. Nicolle	France	Typhus Exanthematicus
1929	A. Harden H. K. A. S. von Euler-Chelpin	Great Britain Sweden	Sugar Ferment. & Enzymes	L. V. de Broglie	France	Wave Character of Electrons	F. G. Hopkins	Great Britain	Growth Promot. Vitamins
1930	H. Fischer	Germany	Pyrrole Chem. & Haemin Synth.	C. V. Raman	India	Raman Effect	K. Landsteiner	Austria	Human Blood Groups

TABLE IV

1931	C. Bosch F. Bergius	Germany Germany	High Press Methods.	No Award			O. Warburg	Germany	Respiratory Ferment
1932	I. Langmuir	United States	Surface Chem.	W. Heisenberg	Germany	Quantum Mechanics	C. Sherrington E. D. Adrian	Great Britain Great Britain	Neurone Funct.
1933	No Award			E. Schrödinger P. A. M. Dirac	Austria Great Britain	Atomic Theory	T. H. Morgan	United States	Hereditary Function of Chromosomes
1934	H. C. Urey	United States	Heavy Hydrogen	No Award			G. H. Whipple G. R. Minot W. P. Murphy	United States United States United States	Liver Therapy in Anemia
1935	E. Joliot Irene Joliot-Curie	France France	Artif. Radioactive Elem.	J. Chadwick	Great Britain	Neutron Disc.	H. Spemann	Germany	Organizer Effect Embryonic Devel.
1936	P. J. W. Debye	Netherlands	Theor. & Expt. Physics	V. F. Hess C. D. Anderson	Austria United States	Cosmic Rays Positron	H. H. Dale O. Loewi	Great Britain Austria	Chem. Transmiss. of Nerve Impulses
1937	W. N. Haworth P. Karrer	Great Britain Switzerland	Carbohydrates & Vitamin C. Vit. & dyes	C. J. Davisson G. P. Thomson	United States Great Britain	Crystal Electron	A. Szent-Györgyi	Hungary	Vitamin C Biol. Combustion Cat. Fumaric Acid
1938	R. Kuhn	Germany (*declined*)	Carotinoid & Vitam. Res.	E. Fermi	Italy	Neutron Reactions Artif. Radioact.	C. Heymans	Belgium	Sinus & Aorta Mech. in Respir. Reg.
1939	A. F. J. Butenandt L. Ruzicka	(*declined*) Germany Switzerland	Sex Hormones Polymeth. & Higher Terp.	E. D. Lawrence	United States	Cyclotron	G. Domagk	(*declined*) Germany	Prontosil
1940	No Award			No Award			No Award		

TABLE V

1941	No Award			No Award			No Award		
1942	No Award			No Award			No Award		
1943	G. de Hevesy	Hungary	Disc. Hafnium	O. Stern	United States	Mag. Moment of Proton	H. Dam E. O. Doisy	Denmark United States	Vitamin K
1944	O. Hahn	Germany	Nuclear Fission	I. I. Rabi	United States	Mag. Moment of Nuclei	E. J. Erlanger H. S. Gasser	United States United States	Neural Research
1945	A. I. Virtanen	Finland	Fodder Conserv.	W. Pauli	Austria	Atomic Fission Exclusion Principle	A. Fleming H. W. Florey E. B. Chain	Great Britain Great Britain Great Britain	Penicillin
1946	J. B. Sumner W. M. Stanley J. H. Northrup	United States United States United States	Enzyme Cryst. Enzyme & Virus	P. W. Bridgman	United States	High Pressure	H. J. Muller	United States	Hereditary X-Ray Effects

TABLE V—Continued

1947	R. Robinson	Great Britain	Alkaloids	E. V. Appleton	Great Britain	Ionosphere	C. F. Cory	United States	Enzyme-Animal
			Sex Hormone Synthesis				Gerty F. Cory B. A. Houssay	United States Argentina	Starch to Sugar Pit. Horm. Funct.
1948	A. Tiselius	Sweden	Colloid Analysis	P. M. S. Blackett	Great Britain	Cosmic Radiations	P. H. Mueller	Switzerland	D D T
1949	W. F. Giauque	United States	Low Temp. Props.	H. Yukawa	Japan	Meson Theory	W. R. Hess E. A. Moniz	Switzerland Portugal	Mid. Brain Func. Prefrontal Leucotomy
1950	K. Alder O. Diels	Germany	Diene Synth.	C. F. Powell	Britain	Photogr. Meth. for Nuclear Proc.—Meson	P. S. Hench E. C. Kendall T. Reichstein	United States Switzerland	Cortisone and Other Adrenal Hormone

TABLE V—SUMMARY

Country	Chemistry		Physics		Physiology and Medicine		Totals	
	Prizes	*Persons*	*Prizes*	*Persons*	*Prizes*	*Persons*	*Prizes*	*Persons*
Germany	16.5	19	9.5	11	7	8	33	38
Great Britain	6	7	10.5	13	5	9	21.5	29
United States	5	7	7.5	9	6.83	13	19.33	29
France	4	6	4	6	3	3	11	15
Sweden	3.5	4	2	2	1	1	6.5	7
Austria	1	1	2	3	3.5	4	6.5	8
Netherlands	2	2	3	4	1	1	6	7
Switzerland	2	3	1	1	2.83	4	5.83	8
Denmark	0	0	1	1	3.5	4	4.5	5
Italy	0	0	1.5	2	0.5	1	2	3
Belgium	0	0	0	0	2	2	2	2
Hungary	1	1	0	0	1	1	2	2
Russia	0	0	0	0	1.5	2	1.5	2
Canada	0	0	0	0	1	2	1	2
Finland	1	1	0	0	0	0	1	1
India	0	0	1	1	0	0	1	1
Japan	0	0	1	1	0	0	1	1
Portugal	0	0	0	0	0.5	1	0.5	1
Spain	0	0	0	0	0.5	1	0.5	1
Argentina	0	0	0	0	0.33	1	0.33	1

If one tabulates the prizes awarded during each decade the results for the larger nations are as follows:

	Germany	*Great Britain*	*United States*	*France*	*Russia*
1901–1910	12	5	1	4	2
1911–1920	7	2	2	3	0
1921–1930	7	7	2	3	0
1931–1940	7	6	7	1	0
1941–1950	2	5	10	0	0

From this table it is evident that Germany and France have suffered a decrease in the number of awards while the United States has shown a considerable gain, with Great Britain maintaining its position rather uniformly. The growth of the United States can be taken partly as a normal growth of the nation as a whole, but significant may be the fact that with the possible exception of France, which has suffered a general political decline during this period, it is in the "free" countries that scientific endeavor maintained its position or continued to grow while Germany's prizes during totalitarian regime and more understandably during the postwar period were largely in recognition for work performed prior to the rise of this regime. Hitler, because of an embarrassing situation in which a German, Carl von Ossietzky, accused by his own government of treason was awarded the Nobel peace prize, actually decreed that no German national may receive the Nobel prize, and established in its place a Hitler prize. The Nobel committees, however, were apparently not influenced by this decision as they continued to bestow them on German nationals whose work they considered worthy of the recognition. Russia's position is difficult to explain unless one considers that it really was quite a backward country, culturally speaking, for most of the first half of the decades under consideration and under the cloak of secrecy of another totalitarian regime for the remainder.

If a similar comparison is made of five smaller European countries which follow in their standing four of the major powers, no such trends can be detected:

	Sweden	*Austria*	*Netherlands*	*Switzerland*	*Denmark*
1901–1910	1	0	3	1	1
1911–1920	2	1	1	2	1
1921–1930	3	3	1	0	2
1931–1940	0	3	1	2	0
1941–1950	1	1	0	3	1

This may be largely due to the greater stability of these countries during this period, with the exception of Austria which, however, made its best showing during its brief period of democratic freedom.

In conclusion, it might be stated, though this by no means represents an exhaustive statistical analysis, it appears that the worthwhileness of scientific contributions thrives best in a "free" climate. The very fact that a number of ex-European Nobel Laureates among other reasons came to this country to seek it would further justify this claim. Let our country take heed that this freedom, our greatest heritage, provides the fertile soil for scientific as well as all other cultural growth.

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Summer Opportunity for Students

The Roscoe B. Jackson Memorial Laboratory at Bar Harbor, Maine, has announced that a research training program for high school students will again be available next summer. The Laboratory's aim is to find scientific ability at the earliest possible age, to bring such talent in direct contact with research workers and materials, and to stimulate in students the desire for knowledge and for the discovery of new knowledge. The Laboratory is the oldest and largest research institution in the world devoted principally to the study of heredity cancer and allied diseases.

To aid in the selection of appropriate students for this group, the school faculty, in consultation with a committee of Jackson laboratory Staff members, endeavors to choose students who have shown outstanding ability in science, seriousness of purpose, mature behavior, and the ability to work and live happily with fellow students. Final selection lies with the Laboratory Staff and is on a competitive basis. Only high school students who have completed at least one course in biology and who have achieved an honor grade (85%) in science and mathematics will be considered. For further information, write to Rosalie Slocum, Public Relations, 40 West 40th Street, New York City 18.

NSTA Supports The NEA Centennial Action Program

By HAROLD E. WISE
President of NSTA

THE CENTENNIAL ACTION PROGRAM adopted by the Representative Assembly of the NEA in July 1952, states the goals of the teaching profession in terms which are sufficiently broad and flexible to give the fullest freedom to every specialized professional group. Since these goals can be achieved only through the united efforts of the profession it is a responsibility of each department of NEA to so orient its objectives and direct its activities that its accomplishments may be in accord with the goals of the parent group.

This article has been prepared in an effort to point out what NSTA has done and is doing to contribute to CAP goals. The goals which give direction to the Centennial Action Program of NEA are as follows:

1. An active democratic local education association in every community.
2. A stronger and more effective state education association in every state.
3. A larger and more effective National Education Association.
4. Unified dues—a single fee covering local, state, national, and world services—collected by the local.
5. 100 percent membership enrollment in local, state, and national professional organizations.
6. Unified committees—the chairmen of local and state committees serving as consultants to central national committees.
7. A Future Teachers of America Chapter in every institution preparing teachers.
8. A professionally prepared and competent person in every school position.
9. A strong, adequately staffed state department of education in each state and a more adequate federal education agency.
10. An adequate professional salary for all members.
11. For all educational personnel—professional security guaranteed by tenure legislation, sabbatical and sick leave, and an adequate retirement income for old age.
12. Reasonable class size and equitable distribution of the teaching load.
13. Units of school administration large enough to provide efficient and adequate elementary and secondary educational opportunities.
14. Adequate educational opportunity for every child and youth.
15. Equalization and expansion of educational opportunity, including needed state and national financing.
16. A safe, healthful, and wholesome community environment for every child and youth.
17. Adequately informed lay support of public education.
18. An able, public-spirited board of education in every community.
19. An effective World Organization of the Teaching Profession.
20. A more effective United Nations Educational, Scientific, and Cultural Organization.
21. More effective cooperation between higher, secondary, and elementary education with increasing participation by college and university personnel in the work of the united profession.

Even as the Centennial Action Program of NEA was being formulated, a special committee of NSTA was engaged in the preliminary work of drafting a Policy Statement to guide NSTA in its future professional endeavors. This committee drew freely from tentative drafts of the goals of the CAP. Thus the Policy Statement approved by the Board of Directors of NSTA in June 1952 (*The Science Teacher*, October, 1952, pp. 234-235) is not only thoroughly consistent with the goals of the CAP but also reiterates and redefines a number of these goals in terms adapted to the specific interests of NSTA. As NSTA proceeds with the implementation of these policies its efforts and accomplishments will, therefore, definitely contribute to the achievement of CAP goals.

One of the principal reasons for the formation of NSTA in 1944 was to develop a strong national organization of *all* teachers of science irrespective of geographic or subject matter lines. Also, from the beginning those persons who are actively participating in the training of science teachers in colleges and universities throughout the Nation have been welcomed as active members of NSTA. As a result the membership of NSTA is truely representative of the fields of elementary, secondary, and higher education. These members cooperate ac-

tively and effectively in endeavors of common interest. This represents one example of the implementation of goal number twenty-one of the CAP.

Early in the fall of 1952 a special committee of NSTA was appointed and assigned the responsibility of preparing preliminary statements describing the patterns of preparation and demonstrable competencies which might be acceptable to members of the Association as describing the "professionally prepared and competent" teacher for each of the generally recognized types of science teaching positions. The work of this committee is intended to constitute a first step in the direction of CAP goals eight and nine as these goals have been adopted in a slightly modified form in the Policy Statement of NSTA. The experience of other professions seems to indicate that agreement within a profession on minimum preparation for professional status must be prerequisite to that profession exerting effective influence on prospective employers. It is hoped that NSTA may make steady progress both in defining adequate professional preparation and in securing recognition and priorities in employment for those who have met these professional standards.

For several years NSTA has been working toward the goal "reasonable class size and equitable distribution of the teaching load" (CAP, goal number 12) for science teachers. In 1947-48, the Association published a bulletin, *Teaching Conditions and The Work Week of High School Science Teachers.* Data presented in this bulletin were obtained by careful study of actual teaching conditions in public schools of the United States and especially of New York state. The findings of this series of investigations were made a special topic of discussion at several NSTA meetings. This bulletin was distributed to high school principals throughout the United States.

Members of NSTA believe that the quality of a community environment is in no small measure dependent upon the educational experiences of the youth and mature citizens of that community who to a considerable extent control the physical and biological environment and who together contribute the social environment. They believe that the science curriculum of grades one to twelve when guided by professionally competent persons is capable of making definite and indispensable contribution to this educational experience to the end that both the adults who have finished school and the youth who are in school may cooperate to "produce a safe, healthful, and wholesome community environment for every child and youth" (CAP goal number 16). This belief on the part of NSTA is well expressed in its Policy Statement which presents as a major aim of science education the following:

> The development of effective personal adjustment consistent with current scientific knowledge of the physical and biological environment, as a means toward achieving confidence and security in the world of today.

Perhaps one of the greatest contributions of NSTA toward the attainment of goals of the CAP has been (and will be) in the direction of goal number fourteen, "adequate educational opportunity for every child and youth". Many of the past and projected future activities of the Association have been aimed at providing greater educational opportunity in science for the talented youth. This has been a major objective of the Packet Service initiated several years ago through cooperation and support of business-industry groups. It has been the topic of discussion at many meetings of NSTA groups. It is a major objective of the newly established Future Scientists of America Foundation, under the auspices of which the student awards program sponsored by the American Society for Metals is being administered. In fact, the location and support of those young people who show promise of growing into productivity in scientific endeavors has been adopted by the Association as one of its major goals (Policy Statement, number four).

Finally, two general activities of NSTA should be mentioned, each of which will undoubtedly make some contribution in the direction of goals established by CAP. During the past year NSTA has produced a manuscript for a full issue of the *Bulletin* of the National Association of Secondary School Principals. This volume which was published in January 1953 will enable approximately forty science teachers to "speak" to some 14,000 high school principals all over the country. Early this fall, a yearbook of the NEA Department of Elementary School Principals will be devoted to science in elementary schools. NSTA has been active as adviser and consultant in the production of this volume. These efforts have potential for developing better understanding of the problems of science teaching at both elementary and secondary levels and therefore for the attainment of mutual goals of NSTA and of the CAP.

NSTA is thoroughly cognizant of the fact that one who belongs to the species "science teacher" is also of the genus "teacher", and that the efforts of NSTA must therefore always coordinate with, and support, the efforts of NEA. We are happy to support the CAP.

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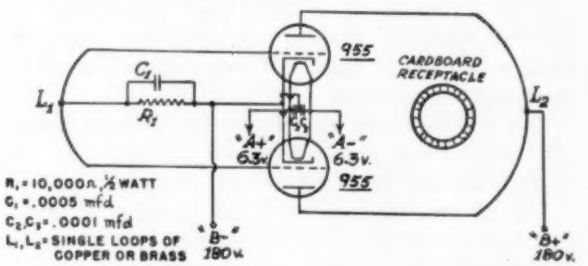
ELECTRONIC PURITY TEST FOR METALS

By GILBERT KOVELMAN

The circuitry of the "electronic purity tester" is fundamentally that of a microwave or ultra-high frequency oscillator.



Oscillator frequency is determined by the inductance and capacitance of the circuit. Therefore any substance placed within one of the oscillator coils will add inductance to that coil and produce a small change in radio frequency. Thus a sensitive microwave oscillator (which contains very little of either inductance or capacitance) is used in the purity tester to obtain frequency changes of a more marked degree. This occurs because the ratio of the newly added inductance to that of the entire circuit is greater than that of lower frequency oscillators.

The first step in using the purity tester is to obtain samples of pure metals and determine the frequencies to which they will tune the oscillator. These pure samples are obtained by electrolytic decomposition after which the following is done:

1. The sample is melted down and molded into a metal lug of chosen size and shape which becomes the standard size and shape for all such lugs.

2. The lug is placed inside the cardboard receptacle of the oscillator coil.

3. The wavelength of the radio wave emitted by the oscillator is measured by means of a microammeter sliding along a Lecher system. From this the radio frequency is calculated by the formula:

$$V = F \times L$$

where V = *velocity* = 10^{10} *cm.*
F = *frequency*
L = *wavelength in cm.*

This procedure is repeated for several metals, the ultimate result being a table of standard frequencies for pure metals. Using this as a guide, it is relatively simple to determine metallic purity. All that is necessary is to make a standard lug from a metal, and compare its frequency with the value given for that metal in the standard table. If the frequencies match, then the metal is pure, but if they differ, then there is some impurity present.

EDITOR'S NOTE: At the time of reporting this science activity, 16-year-old Gilbert Kovelman was in the 12th grade of the Stuyvesant High School in New York City. His entry in the 1952 program of Science Achievement Awards was given a Certificate of Meritorious Achievement. It was done as an individual project in a science class. Gilbert has studied mathematics through calculus and has taken high school courses in applied electricity, electronics, and physics experimentation in addition to the usual biology, chemistry, and physics. His college plans call for the continued study of electrical engineering.

This is the third student Awards program entry to be published in *TST*. We would like very much to hear reactions of teachers—and students—to the idea of publishing such articles. Do they provide encouragement and plant ideas with other students? Should we try to find an increased amount of space for such articles? Would a separate publication of a selection of such articles be more helpful? Your comments and ideas on these and related questions will be most welcome. Meanwhile teachers will be interested to know that a booklet of science teaching ideas based on teacher entries in the 1952 Awards program will be published later this spring; manuscripts are now in the hands of editor R. Will Burnett of the University of Illinois.

SCHENBERG—continued from page 11

students to acquire a broad base in science before attempting specialization. We have every reason to be proud of the great accomplishments of these schools. Their students have gone forth and joined the ranks of first-rate scientists. Their lists of scholarship winners are nothing short of amazing. Even so, I believe the above questions call for a re-evaluation of their science programs.

A glance at the science courses in all of our schools clearly shows that the offering of advanced science courses is no positive indication that the school has a well-balanced science program but rather over-stimulation in one particular science area, due, perhaps, to stimulating teachers in that area. Are we not, after all, engaged in general education at the high school level? Does this not call for more competent guidance?

Many of our school administrators and guidance counselors seem to feel that science is a special domain marked "For boys *only*." In spite of the numerous research studies, the results of the Westinghouse Scholarship Examinations, and the employment of young women in research laboratories, in industry, and in science teaching at all levels, the idea lingers on. This erroneous idea is firmly attached to the study of physics in particular and in some schools *girls have all but vanished from the course*. I recall a grade adviser in a co-educational high school who admonished her girls *not* to elect physics because *she had had great difficulty with a physics course in college!* That is an example of practical experience with a reverse twist. Of course, our girls who are going to college and have taken algebra and geometry will find physics no more difficult than any other subject designed specifically for the 11th or 12th year academic student.

An analysis of the science offerings in our all-girls' high schools reveals that four out of the seven schools offer no physics, three of them have less than 50 per cent of their 10th-year students registered in biology—a course in which girls are traditionally successful—and five of them have less than 10 per cent of their 11th and 12th year students in chemistry. It is hard to believe that some of the girls in these schools could not profit by a course in physics. Having taught for 17 years in an all-girls' high school, I can tell you that given the opportunity, qualified girls can elect physics without hesitation. They will have no more trouble than boys.

Lest we jump to the conclusion that the science registers in the all-girls' high schools are less than in the others, two of the former have a higher percentage of their 11th and 12th year students taking science than have *some* of our co-educational high schools. The poor showing in the co-educational schools may be due to the failure of the girls to elect science, particularly in their last two years. There may be many reasons for the small registers in science classes in some of our high schools—but are they valid?

I would like to state by way of conclusion that all New York City high schools offer Regents' science courses. Forty-four of them offer modified science courses designed specifically for non-college or general students. Eleven schools offer advanced science courses to meet the interests and needs of our brightest students.

Our science rooms and equipment compare favorably with those in other school systems and are better than can be found in most of them.

Our trained science staffs are required to meet the highest qualifications demanded anywhere in the United States. We have every reason to be proud of them.

These troubled times demand a steady stream of scientifically-trained men and women in research, in industry, and in our Armed Forces. They can and must be found among the students in all of our high schools. Our schools have always done a good job along these lines but more intensive work is demanded. This challenge can be taken up by our science staffs. Much of it must come through *more vitalized guidance of our superior students.*

We have come a long way since the Victorian era. The colleges recognize that our cultural climate calls for the inclusion of science experiences. On the high school level, I believe such an education demands a *minimum* of one year of general science, one year of a biological science, and one year of physical science. How can we afford to give ALL of our high school students any less?

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Classroom Ideas

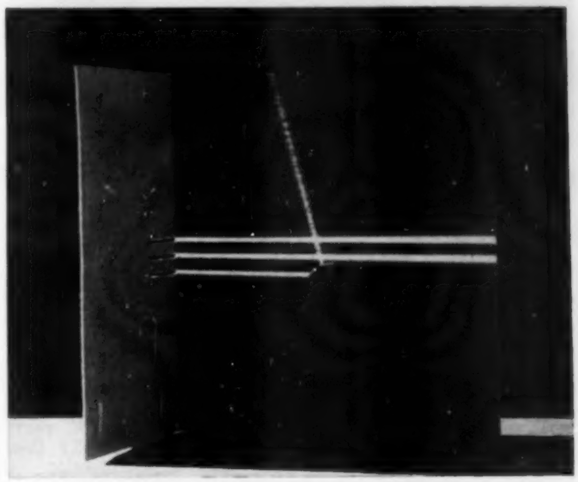
Elementary and General Science

Experiences With Light

By ALEXANDER STÜLER, Superintendent of a "Landkreis," Nördlingen, Germany

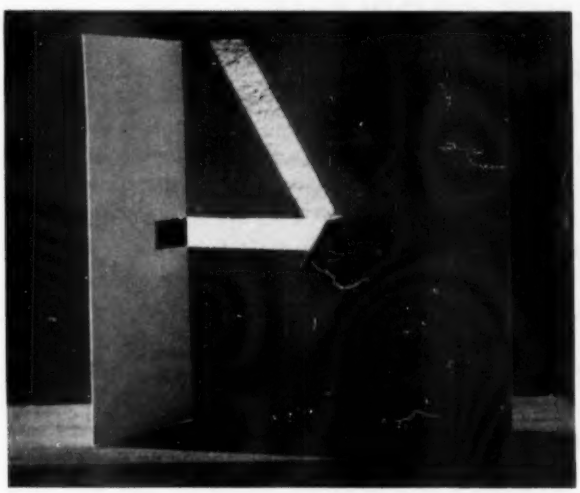
All you need is some cardboard, a dimestore mirror of the rectangular sort, two lenses of suitable focal length (about four inches, "+" and "—"), a prism, and a slide projector.

The slide projector will provide the light needed for the experiments. Six feet or so from the projector you place the cardboard. The cardboard is bent to a right angle and has a slit in its smaller front side, say, two inches long and one inch high. You turn the cardboard screen in a manner so that light entering through the slit shows its way along the inside screen. Then you bring the mirror into the course of the light beam. The mirror will reflect the light, forcing it into another direction. The new way of the beam, depending on the angle between the incoming light and the mirror, will show on the inside of the cardboard.

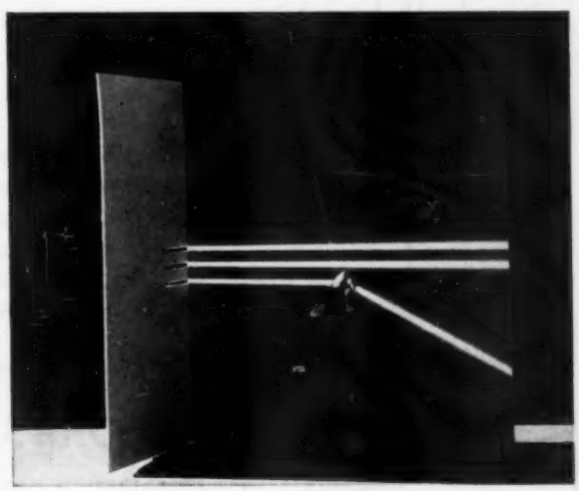


Reflection of light by a plane mirror, demonstrated with a cardboard with three slits.

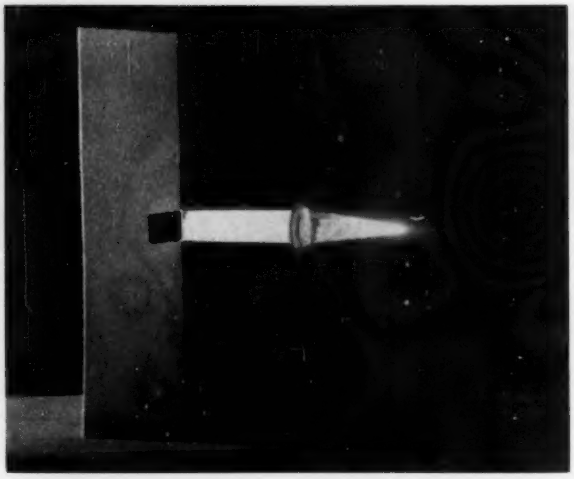
In the same manner you enter the prism into the beam and the light will be refracted, partly or entirely according to how far the prism is thrust into the beam. If you turn the prism about its axis, differing angles will cause different grades of refraction.



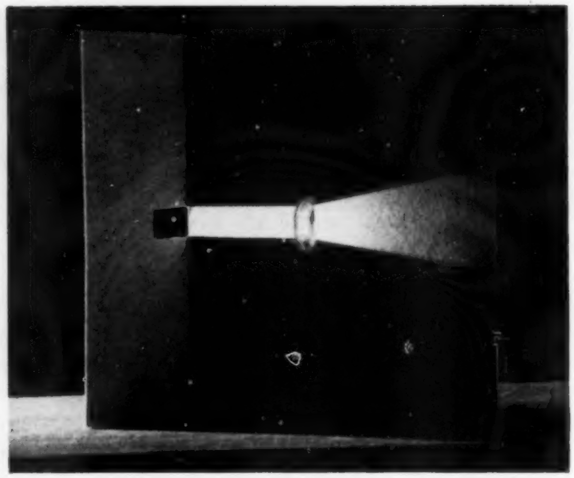
Reflection of light by a plane mirror.



Refraction of light by a prism.



How a convex lens converges light rays.



How a concave lens diverges light rays.

For showing the way of light behind lenses, you are advised to use cardboard with suitable slits in the back of the screen in order to give room for the lenses. You can show then how light is either focused or diverted behind (beyond) the lens, depending on what sort of lens—convex or concave—is used.

In the place of a single broad slit you may use three or even five slits in front of the cardboard, especially if you would like to demonstrate that different zones of the lenses show different powers of refraction. In any case, one slit or more, the simple cardboard will tell more about the behavior of light than a long verbal lecture and will tell it more convincingly.

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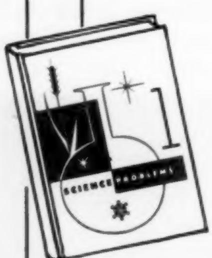

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Hydraulic Demonstrations of EMF, Terminal Voltage, and Types of Circuits

By JOHN WALTERS, Browne and Nichols School
Cambridge, Massachusetts

One of the difficult ideas to get across in the study of electricity is the relationship between EMF and terminal voltage; to show why it is that although EMF is always constant, terminal voltage varies according to current flow. The apparatus pictured in Fig. 1 was devised to help the students visualize this relationship.

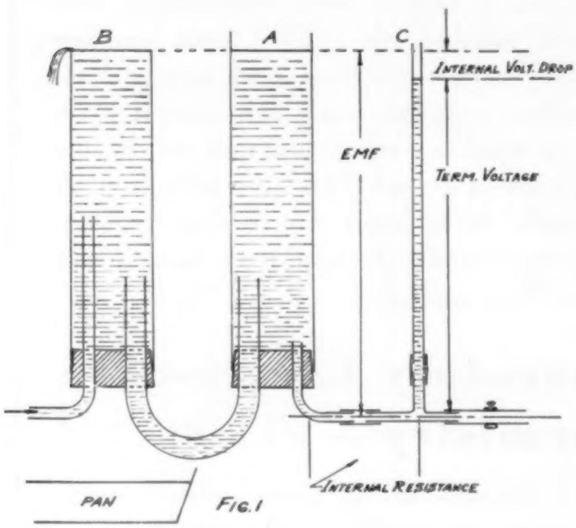

FIG. 1

A is a glass cylinder about 18 in. long and 2 in. in diameter. It is connected by a U-tube about 25 mm. in diameter to a glass cylinder, *B*, slightly shorter than *A* and of about the same diameter. *B* is fitted with an L-shaped piece of 10-mm. tubing which acts as a water inlet. *A* is also connected by a 10-mm. bend and T-tube to *C*, a straight piece of 10-mm. tubing. The free end of the T-tube is fitted with a short length of hose and a clamp.

In use, water is run into *B* at such a rate that it always overflows. *B* functions simply as a reservoir to keep a constant level in *A*. The level in *A* represents the EMF of the cell. The resistance to liquid flow of the tubing between *A* and *C* is analogous to the internal resistance of the cell, and the level of water in *C* represents the terminal voltage. It can be seen that when no water is allowed to flow from the hose, the level in *C* will equal that in *A*, showing that EMF is equal to open-circuit terminal voltage. When progressively greater amounts of water are allowed to flow from the hose, the level in *C* drops. This corresponds to a drop in terminal voltage as increased amounts of current are drawn. The difference in level between *A* and *C* represents the pressure differential required to force current through a constant internal resistance; as more current flows, this differential, or internal voltage drop, must increase. It can be impressed upon the student that since the sum of terminal voltage and internal voltage drop equals EMF, an increase of internal voltage drop must be at the expense of terminal voltage.

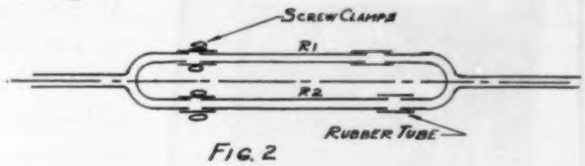

FIG. 2

By making various attachments to the outlet hose the apparatus can be used to demonstrate series and parallel circuits.

To make the analog of a parallel circuit, two 10-mm. T-tubes are bent to form the inlet and outlet, then fitted with hose, clamps, and tubes of varying internal diameter, R_1 and R_2 in Fig. 2. These tubes represent wires of different resistance, and can be made to fit by bushing with short lengths of hose, or by sealing 10-mm. tubing to the ends. By allowing water to flow through each tube independently, it can easily be shown that resistance of both is less than that of either alone. They can also be arranged in series to show the increase in resistance.

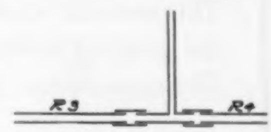

FIG. 3

If two or three tubes are arranged in series, manometer tubes can be set between each, as in Fig. 3, to demonstrate how voltage drop across a resistance varies with the magnitude of the resistance. Tubes of varying diameter, or of the same diameter and different lengths, can be used. The parallel circuit can be put in series with other resistances. Numerous variations suggest themselves.

In making such an apparatus, the dimensions given need not be strictly adhered to, as long as tube *A* is considerably larger in diameter than *C*, the U-tube connecting *A* and *B* is large enough to maintain the level in *A*, and the inlet tube into *B* is well above the mouth of the U-tube. To avoid confusion, tube *B* might be hidden. We supported the apparatus on ringstands with clamps, and caught the overflow from *B* in a pneumatic trough which drained into a sink.

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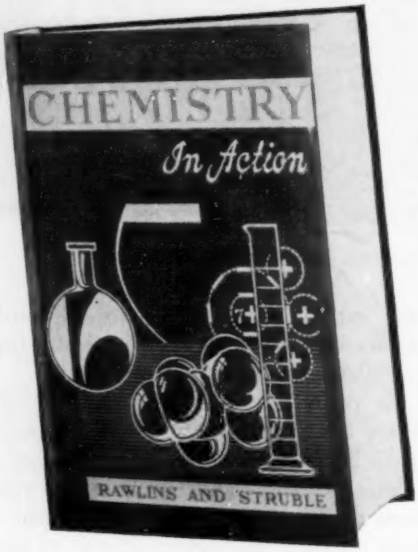

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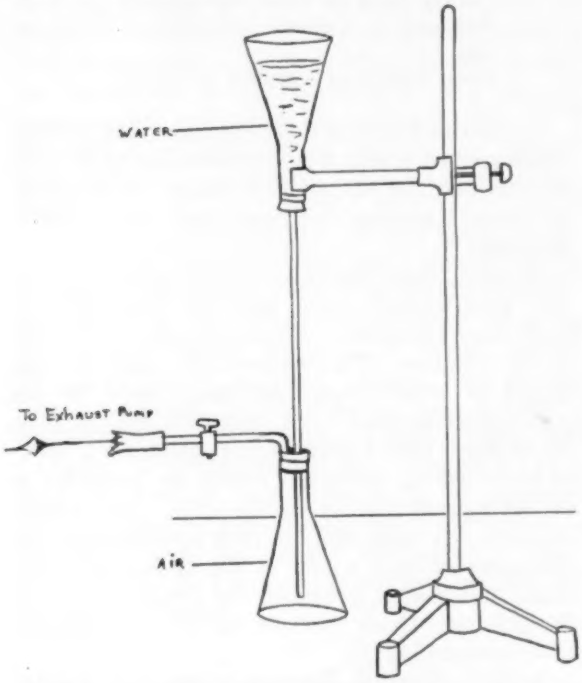
General Science

The Bacchus Experiment with Air Pressure

By DONALD McCROSKEY, Ninth Grade, Central High School, Wadsworth, Ohio; Drawing by Jerry Gorman, Tenth Grade

The simple apparatus I designed for this experiment, as shown in the illustration, has an upper flask which is filled with water. This is connected by means of a glass tube with a lower flask which is filled with air. Why does not the water in the upper flask move into the lower one?



With the use of an exhaust pump remove the air from the lower flask. (Caution: Include a filled calcium chloride drying tube in the line to prevent moisture from entering expensive, motor-driven pumps.) Why does the water in the upper flask now move into the lower one?

Finally, remove the core of the petcock thus opening the upper part of the lower flask to the air in the room. With this final arrangement why does the water rush from the lower to the upper flask?

EDITOR'S NOTE: We suggest that this teaching demonstration could easily be used as the "takeoff" for an evaluation of learning exercise dealing with Ability to Apply Principles or Ability to Interpret Data. Want to try devising such a test? We'd like to see it with a view to *TST* publication.

General

Astronomical Phenomena 1953

Compiled by FLETCHER G. WATSON, Associate Professor of Education, Harvard University Cambridge, Massachusetts

EDITOR'S NOTE: A little late (no January issue of *TST*), but still useful—to classes in general science, earth science, and physics; also for general interest of all. Elementary teachers and their pupils will want to watch for some of these events, such as those of March 8, March 20, and November 14 (*protect eyes* when watching this one!). If you like this listing, drop Fletcher a note and ask him to make it an annual contribution. And let *us* have your requests for other similar listings you believe would be helpful.

Feb.	6	Saturn ends eastward motion; begins westward drift.
	13	Partial eclipse of sun NOT visible in U. S. A.
Mar.	2	Mercury about 25° east of sun, well placed for evening observation.
	8	Venus reaches maximum brightness in evening sky.
	20	Sun crosses equator at 17h, Vernal Equinox.
Apr.	13	Venus in conjunction with sun.
	14	Saturn opposite sun.
	27	Mars passes 1.1° N of Jupiter.
May	19	Venus reached maximum brightness in morning sky.
	25	Jupiter in conjunction with sun.
June	21	Sun farthest north at 12h, summer solstice.
	24	Saturn ends westward motion; begins moving eastward.
	27	Mercury about 25° E of sun, observable in evening sky.
July	5	Earth farthest from sun aphelion.
	8	Mars in conjunction with sun.
	11	Partial eclipse of sun; NOT visible in U.S.A., only from Arctic.
	22	Venus passes 1.9° S of Jupiter in morning sky.
	26	Total eclipse of moon; VISIBLE from U.S.A.; eclipse begins 04:36; totality begins 06:30; central 07:21; totality ends 08:11; eclipse ends 10:05.
Aug.	9	Partial eclipse of sun; NOT visible in U.S.A. only from Antarctica.
Sept.	13	Mars passes 0.8° N of Regulus.
	23	Venus passes 0.4° N of Regulus.
	23	Sun crosses equator at 03h, autumnal equinox.
Oct.	4	Venus passes 0.03° S of Mars in AM sky.
	15	Jupiter stationary; begins westward motion again.
	23	Saturn in conjunction with sun.
Nov.	14	*Transit of Mercury* across sun; VISIBLE from U.S.A.; begins 10:37, central 11:53; ends 13:11.
Dec.	13	Jupiter opposite sun.
	21	Sun farthest south at 23h, winter solstice.

EINZIG—continued from page 16

may be possible for modern scientists to really change one element into another. Since each element is different from every other element because of the number of protons in the nucleus, it is possible to change one element into another by causing it to lose or gain in the number of protons. The story of how radium became lead helped the children to understand radioactivity. The meaning of stable and unstable elements was discussed. From this discussion, the creation of neptunium from uranium and plutonium from neptunium was traced.

What happens when an atom splits was the next problem. The pupils could understand that the formula U-235 means uranium with 92 protons and 143 neutrons in the nucleus of its atom, and that U-238 has 3 more neutrons. A chart helped the children to visualize the things that happen when a stray neutron strikes unstable U-235.

Ninty-two gummed, blue dots representing protons and 143 red dots representing neutrons were fastened close together on the chart to represent the nucleus of U-235. An extra red dot represented the stray neutron which might hit the nucleus. Yellow lines were made to radiate from the nucleus to indicate the release of energy. Below the original nucleus, two new atoms, kryton and boron, were diagramed with dots. More stray neutrons (red dots) were shown at the sides of the chart. These might strike other U-235 atoms and start a chain reaction.

The final problem was to study the possible uses of atomic energy. Emphasis was placed on its peacetime applications and on its possibilities in scientific research. Discussion of the atomic bomb was kept to a minimum. Some of the problems to be overcome before atomic energy can be widely used were listed as follows:

1. Danger of excessive heat
2. Danger from excessive radioactivity
3. Bulkiness of methods of shielding the atomic pile
4. Great expense of obtaining U-235

At the conclusion of this experiment, the material which seemed within the comprehension of the children was written in unit form under the headings: Problems, Learning Activities, and Basic Understandings.

In 1951, eight teachers, in various areas of the city, experimented again with the unit. Most of these teachers reported a keen interest on the part of the children. The teachers felt that the unit served to answer many questions raised by the pupils, since we are living in an atomic age. In 1952, the science radio script writer prepared a series of three lessons on atomic energy to broadcast to all sixth-grade classes in the city. The science teachers, city wide, differ in their opinions as to the placement of such a unit at the sixth-grade level. Many feel that it is beyond the comprehension of the children. Other teachers are most enthusiastic about its possibilities.

At Miles Standish Elementary School, it was felt that the children gained a great deal. This group had an adequate background in elementary science. Each topic studied was related to material they had studied previously. The materials were reduced to essentials; the subject of nuclear energy was by no means exhausted. In as many ways as possible, the subject was made tangible; as many activities were introduced as could be understood by the pupils.

Editor's note: We're inclined to remind other teachers that Cleveland has had an effective elementary science program for many years and hence their youngsters, by the time they reach sixth grade, may have an adequate background for such a unit as this one. In other situations, as the author points out, pupils may not be ready for this study by the sixth grade.

DYNAMIC BIOLOGY TODAY

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OFFICE OF EDUCATION REPORTS ON SCIENCE FACILITIES

Science Facilities for Secondary Schools, Misc. No. 17, is now available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price: 25 cents.

According to the Foreword, "This publication has been prepared to give help in planning space and other instructional facilities for science in secondary schools. It is anticipated that the suggestions will be helpful not only to science supervisors and teachers, but also to school administrators, architects, boards of education, and school housing specialists, who share the responsibility for planning and developing school facilities for science instruction." The Office of Education was invited in 1950 to cooperate with the National Science Teachers Association in the development of a comprehensive study and report on science facilities, and this publication is based on that study. The full report will be available from the Association later in 1953.

This publication includes sections dealing with: Purposes of Science Instruction, The Place of Science in Education, General Principles Concerning Facilities for Science Instruction, Planning Space and Facilities, Location of Science Rooms, Design of Science Facilities, General Utilities, and Other Facilities. Included also are an appendix, a checklist for use in planning, a bibliography, and an index. The publication is approximately 9 x 11¼ inches in size and runs 38 pages. It was prepared by Dr. Philip G. Johnson, Specialist for Science in the Office of Education, and who served as chairman of the NSTA Committee on Facilities for Science Instruction.

DEFENSE MANPOWER POLICY NO. 8

A RECENTLY ISSUED statement of national policy on the "Training and Utilization of Scientific and Engineering Manpower" will be of particular interest to teachers of science in schools and colleges. The statement, issued on September 6, 1952, as Defense Manpower Policy No. 8, makes specific assignments of responsibility for alleviating the effects of scientific manpower shortages to military and civilian agencies of the Federal Government and recommends courses of action for employers of scientists and engineers, for professional associations, and for educational institutions.

Under recommendations to educational institutions it is urged that high school curicula be strengthened "in order that more high school graduates will be eligible for entrance into engineering colleges" and that closer working relationships be established between colleges and universities and high schools "to the end that both high school students and the faculty will become more aware of the opportunities in the engineering field."

The U. S. Office of Education, Federal Security Agency, is given the responsibility for assisting secondary schools in developing more adequate curricula and better teaching methods in order to provide students possessing the requisite aptitudes and interests with the fundamental education necessary for college work in science and engineering."

BUSINESS-INDUSTRY SECTION TO MEET IN ATLANTIC CITY

THE BUSINESS-INDUSTRY SECTION of NSTA will meet in two sessions, 9:30 a.m. and 2:30 p.m., on February 17 in Atlantic City. Both sessions will be held in the Diamond Room of the Hotel Shelbourne, according to Dr. M. Edmund Speare, Chairman of the Executive Committee of the B-I Section. The meeting is in conjunction with the annual convention of the American Association of School Administrators. Science teachers interested and able to attend are cordially invited to do so.

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NSTA Activities

▸ *The Bulletin* of NASSP Now Available Through NSTA

Science in Secondary Schools Today, the January, 1953, issue of The Bulletin of the National Association of Secondary School Principals, is now off the press and is available for purchase from the National Science Teachers Association at $1.50 a copy.

This volume is one that hundreds of science teachers will undoubtedly wish to add to their professional libraries. It might well have been a *Yearbook* of the Association. There are signed articles by thirty-six contributors. These are grouped in five chapters titled as follows: Science Education in American High Schools, Curriculum Problems and Policies in Science Education, Experiences and Experiment—Characteristics of High School Science Teaching, Aids to Instruction in High School Science, and Special Problems in High School Science Education. In all, more than fifty individuals contributed to the production of this issue of *The Bulletin.* Through NASSP it has been distributed to some 14,000 high school principals all over the country.

The committee under whose guidance the book was planned and prepared merits high commendation. Members of the committee were: Paul Brandwein, Head of Science Department and Teacher of Biology, Forest Hills High School, Forest Hills, New York; Frederick B. Eiseman, Jr., Teacher of Physical Science and Chemistry, John Burroughs School, Clayton, Missouri; Greta Oppe, Head of Science Department and Teacher of Chemistry, Ball High School, Galveston, Texas; and Robert Stollberg (chairman), Associate Professor of Science and Education, San Francisco State College, San Francisco, California. Earl R. Glenn, formerly Professor of Science and Education at the State Teachers College, Upper Montclair, New Jersey, worked with the committee during much of its early planning stage. However, professional commitments abroad prevented him from continuing on the committee during the later stages of the project. Since the summer of 1952, Mr. Glenn has been a Fulbright Professor in the Phillippines. Arthur O. Baker, Directing Supervisor of Science in the Cleveland, Ohio, Public Schools and President of NSTA during the work of this committee, and Robert H. Carleton, Executive Secretary of the Association, served as *ex officio* members of the committee.

Thanks are extended also to the National Association of Secondary School Principals, and especially to Dr. Paul Elicker, Executive Secretary, and Mr. Walter Hess, Managing Editor of The Bulletin, for presenting the opportunity to NSTA to prepare their January issue and for invaluable assistance during its production.

▸ *Pittsburgh Convention*

Finishing touches are now being applied to rounding out what promises to be "the biggest thing ever" in a national convention for ALL teachers of science. As is now well known, this convention to be conducted by NSTA will be held March 19 through 21 at the William Penn Hotel in Pittsburgh, Pennsylvania.

Response to preliminary planning has been excellent. Already, nearly 150 participants have been "written into" the program. According to Dr. Nathan A. Neal, general program chairman, here is the plan of the three-day convention, which will be preceded by a meeting

Paul Brandwein

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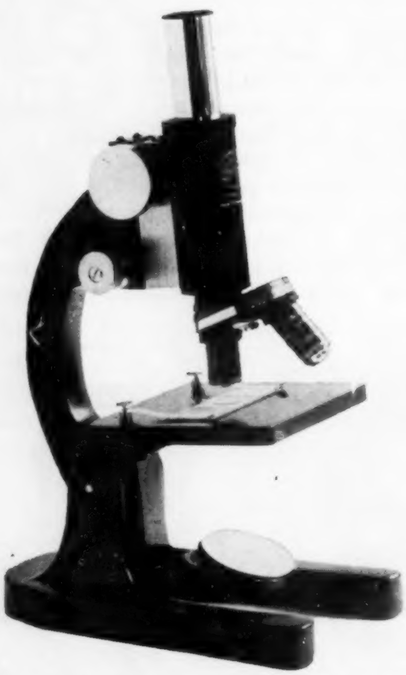

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of the NSTA Advisory Council on Industry-Science Teaching Relations:

Wednesday, March 18

The Advisory Council will hold morning and afternoon sessions under the chairmanship of Dr. John S. Richardson, Ohio State University.

Thursday Morning, March 19

9:00 a.m. Registration opens.

9:00 a.m. Exhibits open. (The 30 to 40 exhibits alone would justify a trip to Pittsburgh.)

9:00 a.m. Session of Advisory Council.

9:30 a.m. Visitation to Pittsburgh schools, one elementary and one secondary, to a modern, "science conditioned" office building, an industrial works, and a research laboratory. Groups will be limited to 15 to 20 persons.

10:00 a.m. Planning session for leaders of work-discussion groups.

Thursday Afternoon, March 19

1:00 p.m. Exhibits open.

1:30 p.m. Official opening of the convention.

1:30 p.m. General session; address by scientist of national prominence.

3:15 p.m. First session of work-discussion groups. Nineteen groups have been scheduled; 12 will meet at each of three work sessions. Some 130 individuals have "signed up" to provide leadership as chairmen, discussants, resource persons, and recorders.

5:00 p.m. Exhibits open until 6:00 p.m.

5:00 p.m. Screening of Science Teaching Films. Official report of the NSTA Film Excerpt Committee working in collaboration with the Motion Picture Association of America and Teaching Films Custodians.

Thursday Evening, March 19

8:00 p.m. Pittsburgh Hospitality Night. Sponsored by industry through Pittsburgh B-I Chapter. All convention registrants are invited as guests.

Friday Morning, March 20

8:00 a.m. Screening of Science Teaching Films continued.

9:00 a.m. Registration continued.

9:00 a.m. Exhibits open.

9:00 a.m. Concurrent Session I: Trends in the Teaching of Elementary Science.

9:00 a.m. Concurrent Session II: Trends in Medical Research.

9:00 a.m. Concurrent Session III: Recent Developments in Physical Science of Interest to Teachers.

10:15 a.m. Second session of work-discussion groups.

Friday Afternoon, March 20

1:00 p.m. Exhibits open.

1:30 p.m. Concurrent Session I: Teaching Science in the Elementary Schools.

1:30 p.m. Concurrent Session II: The Future Scientists of America Program.

3:15 p.m. Third session of work-discussion groups.

5:00 p.m. Screening of Science Teaching Films continued.

Friday Evening, March 20

6:30 p.m. Banquet session. Address by nationally prominent speaker.

Saturday Morning, March 21

8:00 a.m. Screening of Science Teaching Films continued.

9:00 a.m. Registration continued.

9:00 a.m. Exhibits open until 12 o'clock noon.

9:00 a.m. General session; address by Assistant Secretary of the National Education Association.

10:15 a.m. Panel discussion I: The Fifth Year of Training for the Science Teacher.

10:15 a.m. Panel discussion II: Building the Science Program in the Elementary School.

Saturday Afternoon, March 21

1:30 p.m. Concurrent Session I, "Here's How I Do It": Elementary School and Junior High School Science.

1:30 p.m. Concurrent Session II, "Here's How I Do It": Senior High School and College Science.

Six to eight presentations will be given at each of the above concurrent sessions.

Principal speakers engaged for the general sessions include **Alan T. Waterman,** *Director* of the National Science Foundation, Washington, D. C. and **C. J. Van Slyke,** *Associate Director* of the National Institutes of Health, Bethesda, Maryland; **Edward U. Condon,** *Director of Research* Corning Glass Works, Corning, New York, and president of the American Association for the Advancement of Science; and **Watson Davis,** *Director* of Science Service and editor of *Science Newsletter,* Washington, D. C.; **J. A. Hutcheson,** *Vice-President,* Research Laboratories, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania, **Beatrice Hicks,** *Vice-President and Chief Engineer,* Newark Controls Company, Bloomfield, New Jersey, and **Ewan Clague,**

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Commissioner of Labor Statistics, Department of Labor, Washington, D. C.; **Gerald S. Craig,** *Professor of Education,* Teachers College, Columbia University, New York City, **Philip G. Johnson,** *Specialist for Science,* U. S. Office of Education, Washington, D. C., **Albert J. Huggett,** *Professor of Education,* Michigan State College, East Lansing, Michigan, and **Lyle W. Ashby,** *Assistant Secretary,* National Education Association, Washington, D. C.

In addition to the commercial exhibits a display of instructional exhibits is being developed by a local committee under the chairmanship of Dr. W. C. Kelly, Department of Physics, University of Pittsburgh. He invites and urges NSTA members to exhibit new laboratory and demonstration equipment of their own invention, and other favorite teaching aids which they or their students have devised. Such an exhibit should easily be one of the highlights of the convention. *Please write to Dr. Kelly at least two weeks in advance of the meetings and he will arrange necessary space.*

The various addresses, panel discussions, and papers presented at the convention, together with the reports of the 19 work-discussion groups, will be published under the title, *Science Instruction, 1953.* This volume will be distributed free of charge to all NSTA members who register at the convention (registration fee, $2.00). It will be available to others at a cost of $1.00.

Other chairmen of local committees are as follows: *meeting rooms and facilities,* Brother Edward J. Dury, North Catholic High School, Pittsburgh; *hospitality,* E. K. Wallace, Pennsylvania College for Women, Pittsburgh; *Pittsburgh Hospitality Night,* Louis M. Stark, Westinghouse Electric Corporation; *registration,* Ralph Scott, Fifth Avenue High School, Pittsburgh; *tours and transportation,* Isabelle Blyholder, Langley High School, Pittsburgh; *commercial exhibits,* George Cotts, Aluminum Company of America; *publicity,* Hugh G. Norris, Pittsburgh District Dairy Council; *signs and posters,* Albert Martin, Mount Mercy College, Pittsburgh; *ushers and guards,* Hugh Muldoon, Duquesne University, Pittsburgh; *banquet,* Carolyn Gibson, West View High School, West View, Pennsylvania; *audio visual equipment,* H. Clarke Metcalfe, Brentwood High School Pittsburgh; *membership,* Louis Dunlop, McKeesport High School; *promotion,* George W. Cassler, Allegheny County Schools, Pittsburgh.

Hotel reservations should be made with the William Penn Hotel directly and well in advance of the convention. *Do not write to the NSTA office.* A hotel reservation form, as well as a form for making advance registration and for reserving banquet tickets, will be sent to NSTA members in advance of the convention.

If you have not already done so, please bring this national science teaching convention to the attention of your principal and superintendent and urge them to see to it that your school system is represented by one or more attendants. Gratifying indeed are the many reports already received of teachers being granted released time, and in some cases full or partial expenses, to attend the convention. SEE YOU IN PITTSBURGH!

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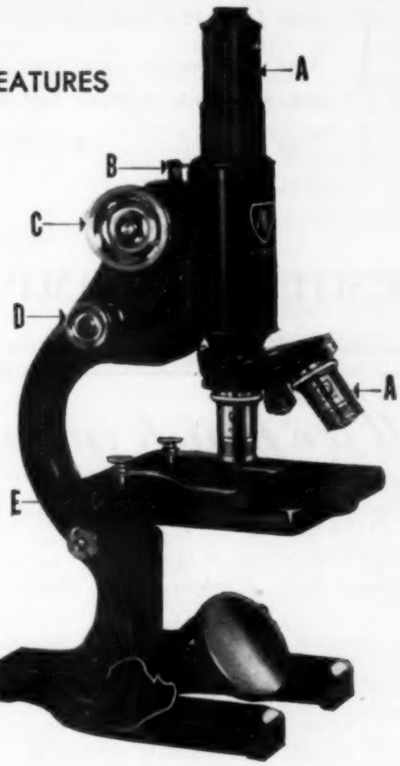

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Book Reviews

THE OUTDOOR SCHOOLROOM FOR OUTDOOR LIVING. William G. ("Cap'n Bill") Vinal. 69 p., paper cover. $1.00. R. F. D. Vinehall, Cohassett, Mass. 1952.

The dean of outdoor teachers presents his philosophy, his arguments, his recommendations for the "outdoor schoolroom." Practical suggestions (such as "Map and Compass Hike," "A Neighborhood Primer") are numerous. There are lists of projects, of discussion topics, of sources of materials. Teachers of field biology and of conservation will find this booklet of high value.

H. A. Webb
Peabody College for Teachers
Nashville, Tennessee

EXPLORING NATURE WITH YOUR CHILD. Dorothy Edwards Shuttlesworth. 448 pages. $3.95. Greystone Press. New York. 1952.

As editor of *Junior Natural History Magazine*, published by the American Museum of Natural History, Mrs. Shuttlesworth has long been sampling the extent and character of juvenile interest in nature. Thus she is in a particularly advantageous position in writing a book that opens many fascinating doors to nature's mansion. The title is rather limiting and not too effectively broadened by the subtitle which says: "An introduction to the enjoyment and understanding of nature for all." It would seem that this book is also valuable to the elementary school teacher, and has a place in the secondary school library for reference purposes. Of course, it will introduce many parents to nature, fully as much as it will children—perhaps even more. Chapters cover birds; mammals; fishes; snakes, frogs and their relatives; insects and spiders; flowers, trees; astronomy, and weather; and their component parts are well selected and interesting. Touches of anthropomorphism, here and there, can, no doubt, be excused since the ultimate audience is said to be from four to fourteen in point of age.

RICHARD W. WESTWOOD
Editor, Nature Magazine
Washington, D. C.

SCIENCE FOR A BETTER WORLD. Morris Meister, Ralph E. Keirstead and Lois M. Shoemaker. 773 pp. $3.20. Charles Scribner's Sons. New York. 1952.

This new general science book is one of the few recent books that sets out to do something and actually does it. It is suitable for use in a terminal science course and as a reference book in a self contained classroom. Accompanying this book are a Teachers Manual and a Workbook.

Content is presented in a manner suitable to the book's intended readers and is broad in scope. Timeliness and consistency with present day knowledge and adolescent needs highlight the content selection.

Although the book contains more than 700 pages there is hardly a page that does not contain a diagram, photograph, or other aid to clarify points for the student with even the greatest reading difficulty.

With the advent of driver training programs in many cities, this text lays a good ground work for the student drivers. The proper method of driving is treated in this book as just as important as what goes on inside the automobile engine. There is excellent coverage of the TV topic including color, and more important is a practical education in atomics, an essential step in widespread American civil defense.

With a wealth of pupil activities, thought problems, illustrations, problem pictures, and many other educational features, this new book fulfills the textbook requirements in the modern objectives of science education.

JOHN D. WOOLEVER
Mumford High School
Detroit, Michigan

CHEMICAL CALCULATIONS—AN INTRODUCTION TO THE USE OF MATHEMATICS IN CHEMISTRY. Sidney W. Benson. 217 pp. $2.95. John Wiley & Sons, Inc. New York. 1952.

The central importance of mathematics to all sciences is well illustrated for chemistry in particular by this book. Yet research and experience have shown a widespread inability of beginning students of chemistry to utilize and appreciate the mathe-

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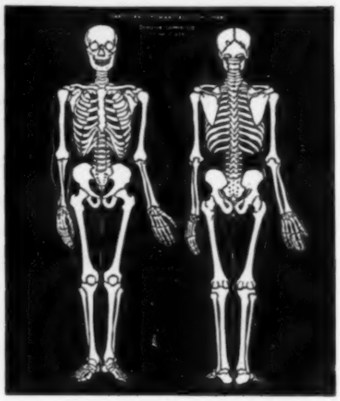

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matical concepts and operations involved.

As a reference work or handbook, supplementary to the chemistry textbook, *Chemical Calculations* should prove a useful tool in overcoming such deficiencies. Its careful organization of text, and step-by-step "type problem" approach attest to the long classroom experimentation which went into its writing. In a few instances, however, there are too many problems given for a corresponding amount of text and vice versa, although generally the balance is satisfactory.

Two introductory chapters recapitulate fundamental conceptions of measurement and mathematical operations such as "conversion factors, standards, and formulae," and explain concisely the role of mathematics in chemistry. Fifteen additional chapters deal with chemical calculations by "unit topics" such as "The Properties of Gases, Chemical Equilibrium, The Concept of Combining Power-Valence," etc. Three appendices contain the answers to problems, tables of common units, and mathematical definitions and operations.

The wide coverage of various areas of chemistry afforded by the "unit topic" approach increases the book's versatility by enabling an instructor to integrate sections of it with his particular teaching plan.

Chemistry students in colleges and some high schools will find this book of assistance.

Seymour Trieger
New Lincoln School
New York, New York

MAN AND THE ANIMAL WORLD. Bernal R. Weimer. 569 pp. $5.00. John Wiley and Sons, Inc. New York. 1951.

Dr. Weimer discusses scientific method and attitudes as applied to biology and related areas, and then treats life principles and processes in relationship to man. Balance is maintained between study of the forms and functions of animal life and the application of these basic informational facts and principles to daily living. Chapters follow on the major animal phyla, environmental relationships, conservation, the nature and origin of life, and evolution; relationships to human economics, health, and disease are stressed.

The vocabulary used may at times prove difficult for the average college freshman. The diagrams are clear and teachable; 16 plates are in color. The photo illustrations are not outstanding. Historical materials included relate directly to the text matter.

The combined glossary and index is concise and complete.

Dr. Weimer's book should prove adaptable to most college freshman zoology courses, and as a reference book for secondary school life science teachers.

B. Bernarr Vance
Daniel Kiser High School and
The University of Dayton
Dayton, Ohio

General Education in Science. I. Bernard Cohen and Fletcher G. Watson, Eds. 217 pp. $4.00. Harvard University Press. Cambridge, Massachusetts. 1952.

General Education in Science, according to President Conant writing in the Foreword, is addressed largely to the solution of the problem of " . . . . . how to start the student down a road that will insure his arriving at some degree of scientific literacy even though he devotes his college years to the study of some nonscientific subject."

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The book consists of a series of 15 papers originally presented by teachers of science, college administrators, and research workers at the Workshop in Science in General Education held at the Harvard Summer School in 1950. It is difficult to single out for special commendation the paper of any one contributor. Each paper has its own significance in the field of general education courses in the sciences. However, it may be of value to note the particular papers which deal with problems that are vexing many teachers of science. The problem of, "What is 'the scientific method'?" is discussed in the papers by Dubos and Cohen; the philosophy, aims, and the practical aspects of carrying on a science course in a program of general education are discussed by French, Sears, Kemble, LeCorbeiller, Fuller, Castle, and Erikson; the place of historical material in a general education course in science is discussed by Cohen, Nash, and Kilgour; the problem of how to resolve the confusion between science and the products of science is discussed by Dubos and Goudsmit; methods of evaluating general education courses in the sciences are presented in the papers by Dyer and Watson.

While it was generally assumed by the contributors that the discussion centered about the formulation of science courses for the student who intends to specialize in a non-scientific field, at least one of the contributors feels that the same general course in science should be taken by this student and the one intending to major in the field of science.

Each of the 15 contributors believes that traditional science courses do not contribute greatly to the fulfillment of the aims of general education. Occasionally the contributors discuss the points of view of the opponents of the integrated science approach (of whom there are many). It is difficult for the teacher on the sidelines to form valid judgments from the one-sided approach made by *General Education in Science.* The teacher interested in this problem is urged to read the contributions in *Science* and other journals by supporters of the traditional college science courses.

In this short review it is not possible to deal with the philosophy and principles of general education which have occupied so large a place in the discussion of college curricula during the past 10 or 15 years. However, it should be pointed out that the problems of instituting courses in science in programs of general education are akin and linked with the problems involved in the setting up of similar courses in the social sciences and the humanities. President Conant sees the larger problem as one of " . . . initiating educational processes by which twentieth-century experts can eventually

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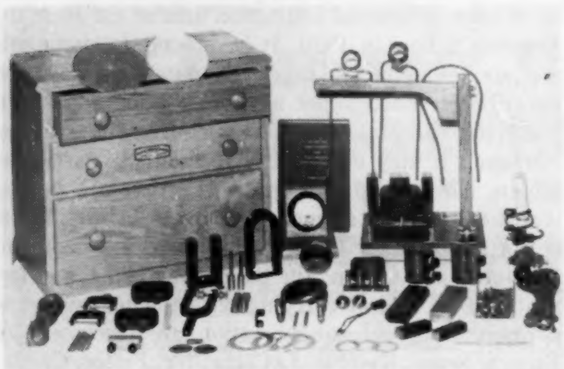

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understand and communicate with one another."

One is a bit disappointed that so little space was allotted to the discussion of the relationship between the science curricula in the high school and the science courses considered in *General Education in Science*. This problem is of particular moment today, especially in view of the important experiments being conducted on the influence of shortening the period of high school education.

Despite the similarity in name, there is little parallel between the contents of this volume and those of McGrath's *Science in General Education.*[1] The latter is largely a presentation of sketches of specific science courses offered in the general education programs of several colleges and universities. *General Education in Science* draws for the most part on the experiences of individuals with the Harvard Case History approach. Together, the two books will serve admirably to acquaint the interested science teacher with the newer points of view in college science teaching.

ABRAHAM RASKIN
Hunter College
New York City

[1] *Science in General Education*. Earl J. McGrath, Ed. Dubuque, Iowa: William C. Brown Company, 1948.

SCIENCE: A STORY OF DISCOVERY AND PROGRESS. Ira C. Davis, John Burnett, and E. Wayne Gross. 562 pp. $3.44. Henry Holt and Company, Inc. New York. 1952.

Science: A Story of Discovery and Progress should not be overlooked by teachers of general science everywhere working with young people at the ninth-year level. It is a complete, up-to-date revision of a widely-accepted, popular textbook published in 1936.

The unusual interest-arousing approach of the subject matter is quite different from the earlier book. The authors introduce the What (a topic) by using a familiar example. For instance, two boys make a raft and know that wood floats—but how? Then follow pupil activities and demonstrations to show What happens—and How. Finally, the authors explain the activities or demonstrations by giving enough simple and clear interpretation so the student can reason Why.

The scientifically accurate content is organized around nineteen unit-problems, broad in scope. These deal with traditional topics arranged in the following order: forces of nature, air pressure, fire and fuels, temperature and heat, weather and climate, water, transportation, the universe, light, sound, electricity and magnetism, communication, machines, power and combustion, composition of matter, the earth, plant growth, human anatomy, and health. To increase interest, a historical survey precedes each of these major topics.

In this text there are a wealth of learning aids. These include: key words, introductory-review-discussion-test questions, planned-pupil and easy-to-do-demonstrations, oral reports, research topics, home and school projects, summaries, biographical glossary, study words, and a very complete specific supplementary list for outside reading. These helps are so placed in the units as to encourage and sustain pupil learning.

Throughout the book there are abundant and superior self-explanatory drawings as well as actual photographs.

Another commendable feature is the eye-appealing format, double column easy-to-read print. This should add to reading comfort and speed.

In the opinion of the reviewer, this all-important book should stimulate both student and teacher alike toward a deeper understanding and appreciation of the scientific world.

MAITLAND P. SIMMONS
Irvington High School
Irvington 11, New Jersey

CAREER CONFERENCE IN OKLAHOMA

High school science teachers in the Oklahoma area are invited to a joint conference with college chemistry teachers and professional chemists and chemical engineers in Norman, Saturday, March 7. The conference seeks to exchange viewpoints and experiences in vocational guidance and recruitment of prospective chemists and chemical engineers, especially aiming for a better understanding of all factors involved. A secondary objective seeks a practical action program for coordinated efforts. No phase of the problem is immune to discussion.

Ralph W. Lefler of Purdue University and Wayne Taylor of Denton, Texas, Senior High School will represent NSTA in the discussion groups. Lefler will also be representing the Future Scientists of America Foundation. B. R. Stanerson of the American Chemical Society and George Hays of the American Institute of Chemical Engineers will speak for the professions. Claude Boatman of Central (Okla.) State College and Luis Bartlett of Oklahoma A. and M. College will preside over the discussion periods.

Further details are available from H. H. Bliss, 61 Faculty Exchange, University of Oklahoma, Norman, Oklahoma.

NOTE: The Future Scientists of America Foundation would like to know about and would welcome invitations to cooperate in planning and conducting other such conferences as this one, since student guidance, career conferences, and related activities form one of the principal fields of action.

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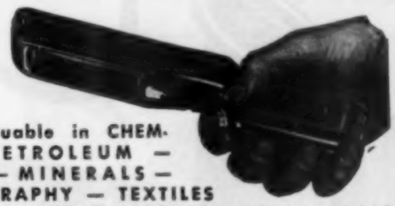

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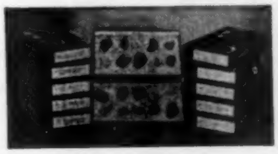

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